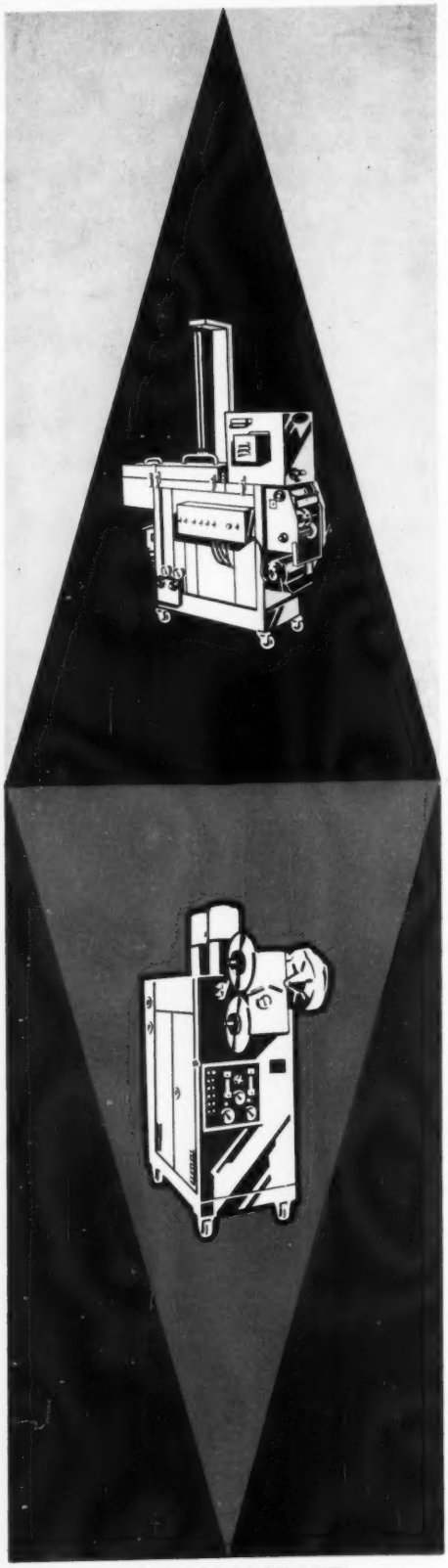
PMI

PHOTO METHODS FOR INDUSTRY

MOTION PICTURE SECTION

FIFTH INTERNATIONAL CONGRESS ON HIGH SPEED PHOTOGRAPHY, WASHINGTON, D. C., OCTOBER 16-22



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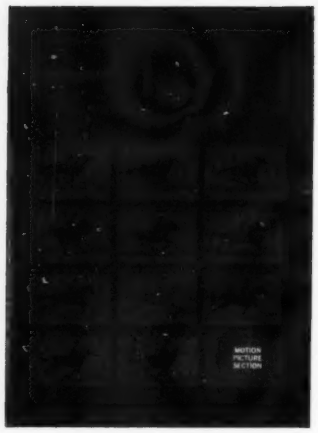

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FEATURES

OCTOBER, 1960 • VOL. 3 NO. 10

31 EDITORIAL The Small Ones Have To Be Best

32 HIGH SPEED AT M.I.T. *Edward R. Farber & David B. Eisendrath, Jr.* Our columnists report on high-speed photography conference at Cambridge, Mass.

36 PHOTO DEPARTMENT ANALYSIS FORD MOTOR CO. Dearborn motion picture unit competes with outsiders for company films

41 RESEARCHER'S REPORT *Willard Allphin* Why the fluorescents are so tricky to use in photography

42 THE FILM REPORT *Philip Geraci* Government demands rise as U.S. discovers films make the plain facts inescapable

46 WHAT'S WRONG WITH SCIENTIFIC PHOTOGRAPHY? *John Waddell* Individualist calls for collective action to better American scientific photographers

48 THE NEWEST FRONTIER *Harold Edgerton & Sam Raymond* Photography explores the still unseen ocean depths

51 MEMO ON PHOTO MANAGER'S HEADACHES They're surprisingly alike, pass the aspirin

52 DOUGLAS AIRCRAFT CO. *Ernest E. Reshovsky* Crack unit scores on all fronts: sales, PR, documentations, instrumentation

57 HYZER ON HIGH SPEED How to estimate lighting requirements

58 READER'S SHOWCASE Choice pictures from PMI's readers

REPRODUCTION SECTION

66 SPEAKING OF PICTURES Continuous-tone microfilm eases *Life's* picture filing problems

68 REPRODUCTION & GRAPHIC ARTS *Herbert P. Paschel* A short course in the theory of line and halftone for photo men

72 MICROREPRODUCTION *Vernon Tate* Quality standards for microreproduction of text and line, Part II

DEPARTMENTS

6 FYI A column of personalities and news for your information

10 COMING UP Calendar of exhibits, conferences, meetings, etc.

14 METHODS FOR TOMORROW Formulary for color processing; high resolution x-ray microscopy. *Lloyd Varden*

16 INDUSTRIAL COLOR Kodak's new color photo handbook. *Samuel Lang & Leonard Zoref*

20 INDUSTRIAL MOTION PICTURES Broaden your horizon by looking at work of other film makers. *Arnold Eagle*

26 PHOTO INSTRUMENTATION Elements of the photo instrumentation system: Part II *Ernest Reshovsky*

83 FREE LITERATURE Booklets, folders, data—yours for the asking

89 NEW PRODUCTS What's new for the industrial photographer

96 IN-PLANT TEST Chief Henri Silz reports on the Kenyon Gyro Stabilizer

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THE BODY of the LEICA is housed in a rigid, one-piece casting that assures constant, precise alignment between lens and focal plane despite hard daily use.

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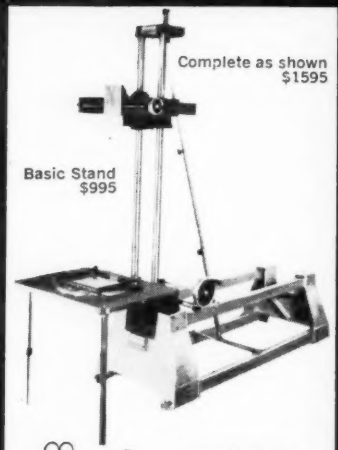

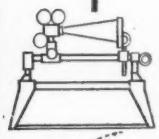

IN HORIZONTAL POSITION
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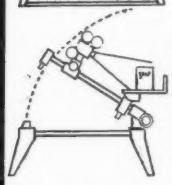

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F.Y.I.

Earl Stanton, head of the photo department at Bell Aerosystems, Buffalo, N. Y., was elected an Industrial Director of the Professional Photographers of America at the recent (August 7-12) convention in Chicago. Stanton is one of the outstanding figures in industrial photography today both professionally and personally. Professionally, he is a member of the National Press Photographers, American Rocket Society, Buffalo Press Club and an instructor at the PPofA's Winona School of Photography. Personally, he is a warm, friendly person who has given freely of himself to his fellow photographers.

Starting as a press photographer, he worked for United Press for a time. His viewpoint on the in-plant camera is that "photographers in industry (must) advance the profession, research every new use and keep the craft on a high level by servicing every client as carefully and professionally as budgets and personnel will permit."

Hampson honored, too

Honors were also accorded James Hampson, chief of the photo section at Arkansas Fuel Oil Corp. in Shreveport, La. Hampson has been with the firm for 30 years. A man of "firsts", he was the first industrial photographer to be president of a regional association, first PPofA industrial director, first on the PPofA industrial council, first industrial photographer to hold office in the PPofA and first industrial photographer to hold the Master Photographer degree, awarded by PPofA.

Kodak technical sales managers

Kodak has created the position of technical sales manager in each of the company's eight regional sales divisions to direct the tech reps in sales and servicing of professional photographic and graphic arts products.

The following appointments were announced by T. F. Pevear, Kodak vice-president and director of sales administration:

M. L. Bokman, Pacific Southern Sales Division; Frederick Chandler, Southwestern Sales Division; Joseph Jiloty, Midwestern Sales Division; James E. McGhee, Jr., Middle At-

(*continued on page 8*)

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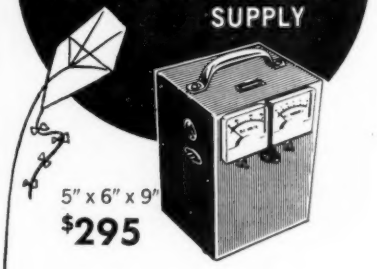

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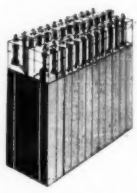

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What could possibly make a camera worth $500?

THE work you can do with it, nothing else.

The precision and resolving power, for example, that have led many studio photographers to use a Hasselblad 2¼ x 2¼ single-lens reflex instead of an 8 x 10 view camera.

The interchangeability of lenses, film backs and accessories—over 100 camera set-ups in all—that enables a professional to carry a Hasselblad instead of half his studio on location assignments.

The automatic aids that let the pro concentrate on his subject instead of the camera, and help the amateur make up in part for the intimate knowledge of light and optics that marks professional work.

Hasselblad lenses, for instance, make color and detail almost automatically perfect. These lenses have Synchro-Compur shutters and are made by Carl Zeiss of the best optical glass in the world. Resolving power—the acid test of any lens—permits greater enlargements than virtually any other lens made today.

The Hasselblad reflex system alone costs more to make than many cameras sell for. On its ground glass viewer you see a print-size preview of the quality you will get—focus, depth of field right through the lens (and no parallax). A pop-up magnifier even shows details too tiny for the naked eye.

Diaphragms of Hasselblad lenses are automatic. They remain open until you shoot, so that your view cannot get away from you. If you wish, you can also stop the diaphragm down by hand.

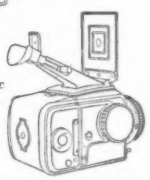
The EVS system synchronizes diaphragm openings to shutter speeds. You simply set your lens for a code number and your speed and aperture will be automatically aligned. You can then change to any other speed and your aperture will change with it—automatically.

Hasselblad interchangeability? You can switch from color to black and white in mid-roll, or from telephoto to wide angle, or to a sports viewer, or to a magnifying hood for shots through a microscope. You can set up for almost every shot known to photography in seconds.

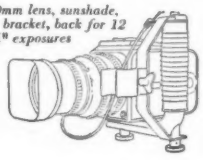
What could possibly make a camera worth $500? The work you can do with it, nothing else. With Zeiss Planar 80mm f/2.8 lens, $489.50.

Write Dept. HPM-10 for literature and the name of your nearest Hasselblad dealer. PAILLARD Incorporated, 100 Sixth Avenue, New York 13, New York.

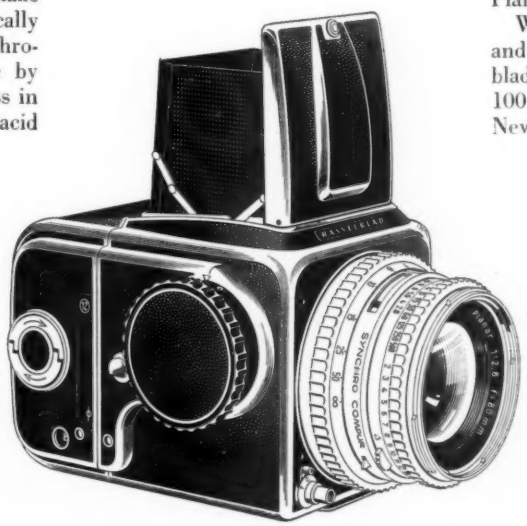
With magnifying hood, 60mm lens, back for 16 1⅝" x 2¼" exposures, exposure meter knob

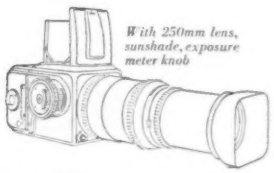


With prismatic sports finder



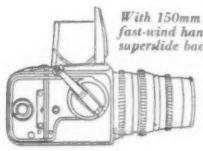
With 150mm lens, sunshade, flash gun bracket, back for 12 2¼" x 2¼" exposures





With 250mm lens, sunshade, exposure meter knob

With magnifying hood, cut film adaptor and holder



With 150mm lens, fast-wind handle, 2" x 2" superslide back

HASSELBLAD

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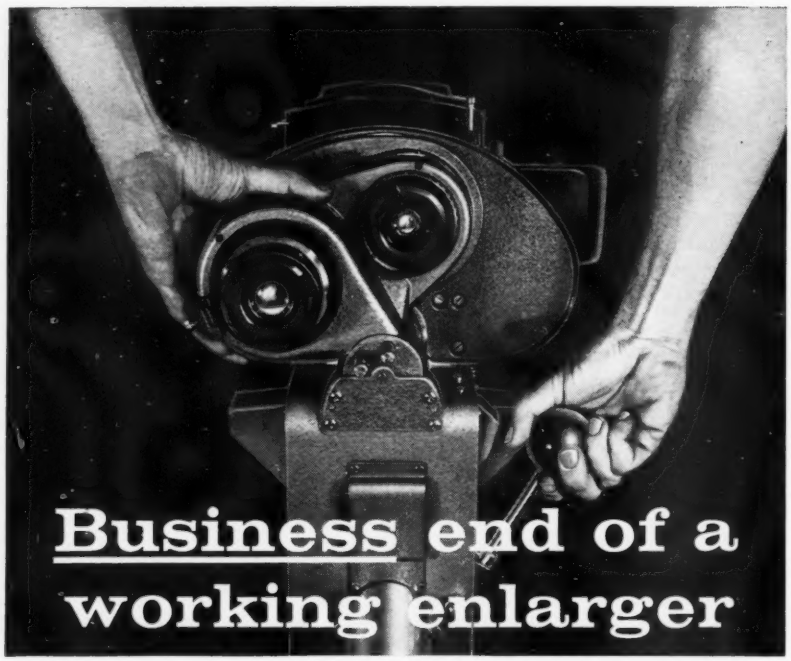


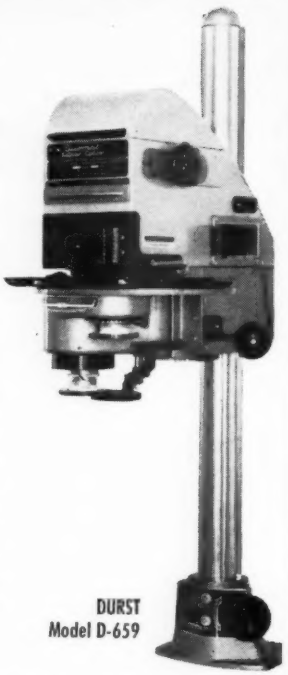
Auto-focus Twin-Lens DURST DUOMAT designed with speed in mind!

With just a twist of the wrist you automatically change lenses and condensers simultaneously to accommodate negatives from 35mm to 2½x3½".

A self-masking negative carrier and factory-fitted 50mm and 105mm Schneider Componar or Componon lenses are standard equipment.

Rapid counterbalanced height adjustment and rigid column eliminate struts and braces. Built-in filter drawer is located above condensers.

These are but a few of the amazing "built-in" features that make the DURST DUOMAT the ideal enlarger for fast, efficient and profitable darkroom operation. Write today for the DURST DUOMAT folder and complete information on the entire line of DURST enlargers. See why DURST enlargers are *First Choice with Professionals Throughout the World!*



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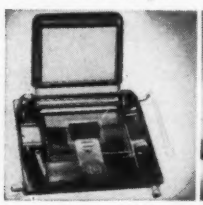
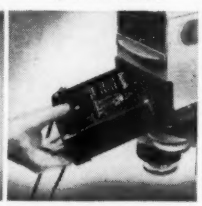
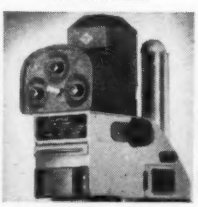


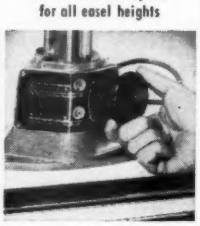
Accessory COLD LIGHT unit replaces condensers



Accepts Agfa variable color filter head



Focus Variator adjusts for all easel heights



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FYI

(*continued from page 6*)

lantic Sales Division; Louis J. Parker, Northeastern Sales Division; Robert Perko, Kodak Hawaii; Robert Schulz, Southeastern Sales Division; Gordon Stevens, Pacific Northern Sales Division.

Also from Kodak is the news that Paul E. Pallett and Melvin L. Newsom have joined the staff of Kodak's Professional Technical Service Center, Rochester, N. Y. Their duties will be taking pictures for Kodak Sales Department exhibits and work with visitors to the center. Pallett, formerly in charge of GE's photo lab at the Research Lab, Schenectady, will deal with industrial photography. Newsom, who has a Master of Photography degree, will deal with portrait photography.

Long-hair stuff

Our American Heritage was the theme of the 14th Annual Meeting of the University Film Producers Association, meeting at William and Mary College, August 7-13. More than 40 universities were represented by the 211 people present at the sessions. Forty films made by university producers were screened and discussed. The subject matter included dope addiction, immigration and parasites.

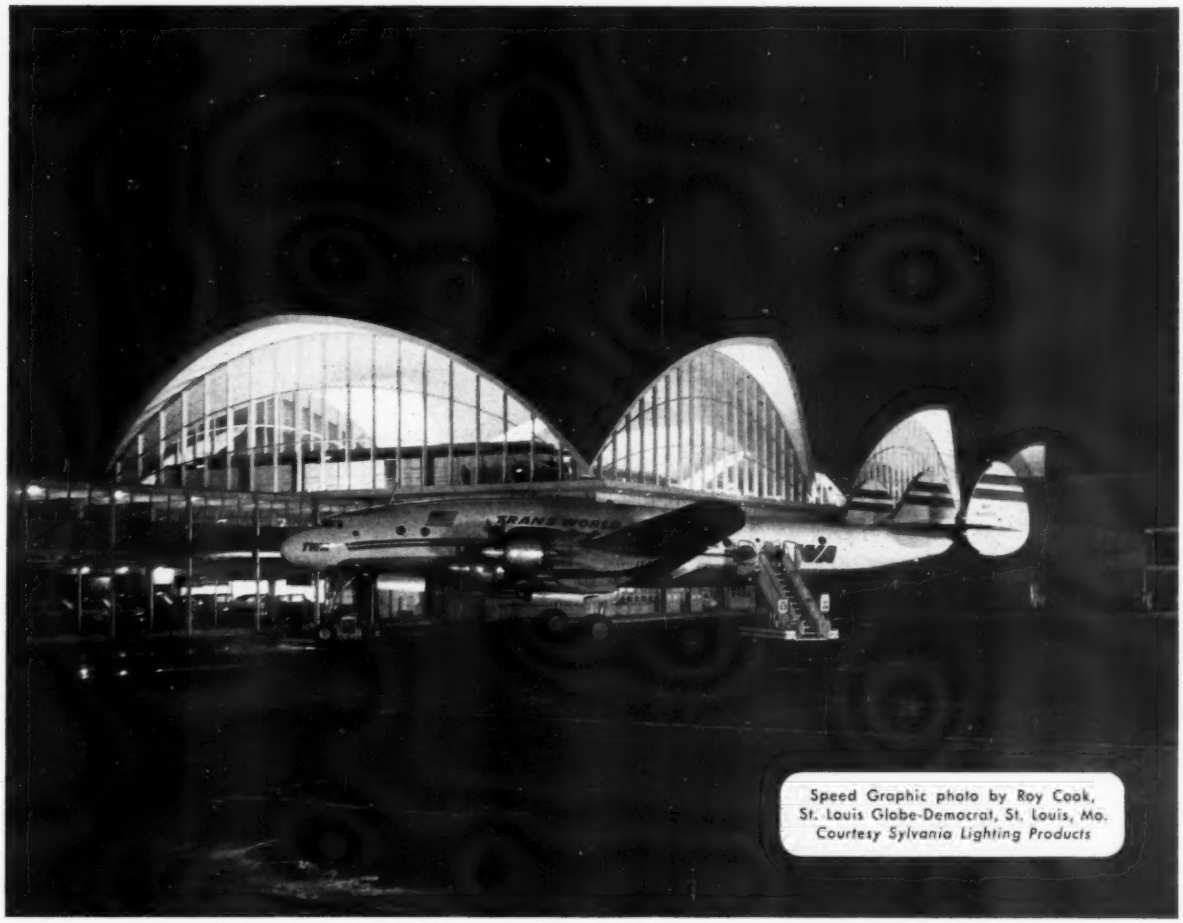
The University Film Producers Association held its first meeting in 1947 at the University of Iowa with seven schools represented. Today, 82 schools are listed and members account for about 40 per cent of the non-sponsored educational films made in the United States.

A new process, patented by Martin Ostergaard, Jr., uses ultrasonics to increase the speed of photographic film up to 10X normal. The process, according to Ostergaard, will have applications for industrial and scientific use. It provides agitation without surface oxidation, resulting in denser negatives than are possible with other agitation methods. The grain structure is said to be finer. The patent was assigned to Gulton Industries, Metuchen, N. J. The inventor is photographer for the company who got the idea when he observed the use of ultrasonics in watch-cleaning.

Notes and news

Allegro Film Productions is a new firm headed by Jerome Forman, formerly sports, news and special projects editor at Hearst Movietone News and Telenews. The company will supply editing, sound, script

(*continued on page 13*)



Speed Graphic photo by Roy Cook,
St. Louis Globe-Democrat, St. Louis, Mo.
Courtesy Sylvania Lighting Products

"When it's ONE TIME—ONE SHOT, I can always depend on my Graphic*"

says Roy Cook, Asst. Chief Photographer, St. Louis Globe-Democrat

The dependability of a Graphic knows no equal. That's why photographers whose livelihood depends on superior results under any and all conditions . . . in situations where one chance is the only chance . . . depend on Graphic cameras.

The picture above, by Roy Cook, is an example. Because 100 flash bulbs were used for lighting, there was only one chance . . . so he used his Speed Graphic "to be sure of my shot." It was taken at Lambert Field, St. Louis, at 10:30 P.M. on Saturday, March 19. Diaphragm was set at f/32. The shot was set up and staged by Sylvania Lighting Products to herald the opening of the MPDFA Convention.

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COMING UP

OCTOBER 10-13 Fourth Annual Industrial Film & A-V Exhibition. New York, N. Y.

OCTOBER 13-14 Graphic Arts Centralized Information Service Conference. Extended Services Division, Rochester Institute of Technology, Rochester 8, N. Y. Contact Harold Kentner, director, for information.

OCTOBER 14-15 High-Speed Processing Symposium sponsored by Society of Photographic Scientists and Engineers (SPSE), Shoreham Hotel, Washington, D. C.

OCTOBER 16-22 5th International Congress on High-Speed Photography sponsored by Society of Motion Picture and Television Engineers (SMPTE), Sheraton Park Hotel, Washington, D. C.

DECEMBER 3-5 Fourth Annual International Visual Communications Congress, Hotel Sherman, Chicago, Ill.

MONTHLY MEETINGS

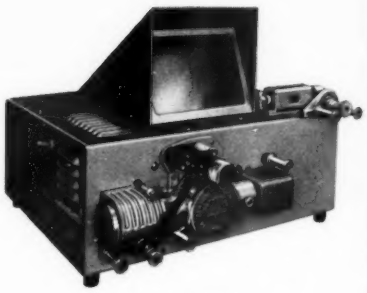
Association of Federal Photographers Meetings every third Wednesday at 8 p.m. G.S.A. Building, 7th and D Sts., S. W., Washington, D.C.

Cleveland Chapter SPSE Meetings the first Tuesday of each month. Cleveland Engineering & Scientific Center, 3100 Chester Ave., Cleveland, Ohio. Contact Robert E. Birr, General Electric, Nela Park, Cleveland, Ohio. GL 1-6600.

Rochester Chapter SPSE First Monday. Contact Woodlief Thomas, Jr. Color Technology Division, Building 65, Kodak Park, Rochester 4, N. Y. CO 6-2500.

Industrial Photographers of America Essex House, Newark, N. J. Meetings every second and fourth Thursday. Contact Tom Holbarton, 181 Lake Drive West, Packanack Lake, Wayne, N. J. Or R. Handley, The Port of New York Authority, 11 8th Ave., New York 11, N. Y. AL 5-1000, Ext. 605.

National Visual Presentation Association Inc. New York City. Meetings every second Thursday. Contact M. E. Schack, 19 W. 44th Street, New York, N. Y. MU 2-2294.



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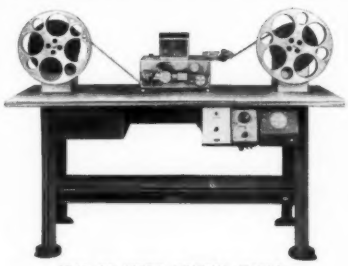

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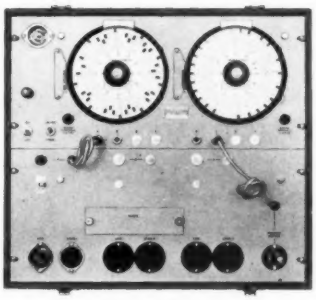

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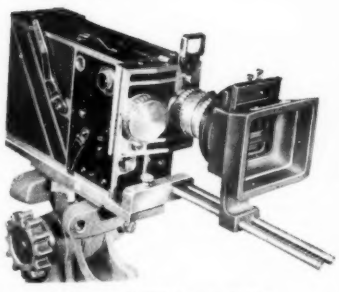

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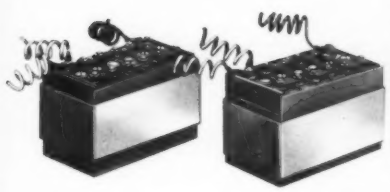

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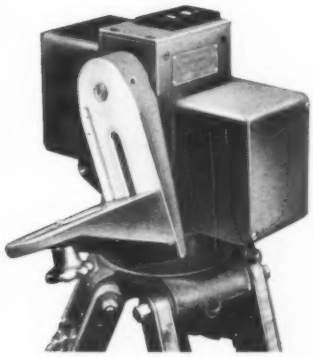

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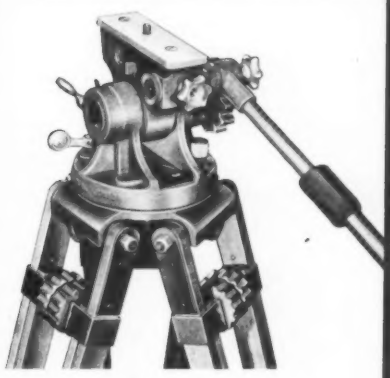

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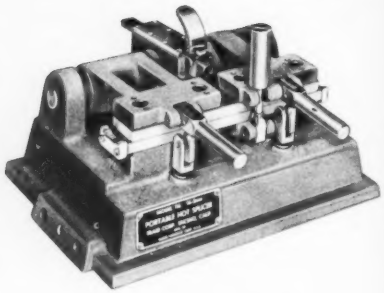

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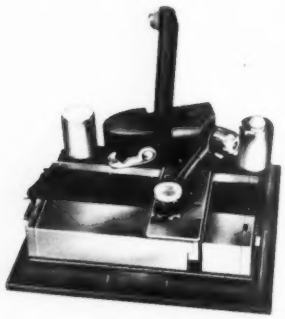

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and production services to individual film makers. Allegro is located at 723 7th Avenue, New York.

The first in a projected network of Agfacolor negative film processing stations was established by Agfa, Inc. It is at Prisma Custom Laboratory, 61 North Broadway, Milwaukee, Wisc. They will turn out 5 x 7, 8 x 10 and 11 x 14 prints from Agfacolor negatives. Perfect Photo, Philadelphia, will continue normal processing of Agfacolor film.

Expansion move

Admaster, one of the leading companies in the preparation of slide presentations, is moving to larger quarters at 425 Park Avenue South, New York, N. Y. This street, which is still known to natives by its former name, Fourth Avenue, is becoming a photographic center with such firms as Leitz, Allied Impex and Scopus all doing business within a stone's throw from each other. Fortunately for passers-by, the inhabitants are friendly.

Leo Pavelle is now director of new product development at Technicolor. Pavelle, a veteran of the photo industry, was formerly director of Technicolor consumer photo products division.

Criterion Film Laboratories, a fellow tenant of 33 West 60th St. with PMI, Modern Photography and Amphoto, now has the entire second floor of the building. The company has added 7000 square feet to their former floor space and has installed several new cutting rooms for the use of their clients.

Missing pages

Sharp-eyed PMI readers, of whom there are legion, will notice that the page after 96 is not 97 but 101. This is not a printer's error nor a derelection on the part of our editors. The missing four pages are bound in a special Western edition of PMI which is going to our readers 'way out yonder, past the Rocky Mountains and all that.

The West has become so important, photographically, and so active, that PMI feels there should be a special supplement to handle western affairs. One might compare PMI's Supplement for Western Affairs to the old Bureau of Indian Affairs. That is, one might compare them if he could think of any resemblance. However, this is just to reassure eastern readers that nothing was left out. Something just wasn't put in. P.S. FYI needs news, PDQ.—THE END

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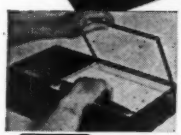

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by Lloyd E. Varden

PHOTO METHODS FOR TOMORROW

Formulary for color processing; high resolution x-ray microscopy

Film manufacturers abroad, for the most part, were reluctant some years ago to publish processing formulas for certain of their products, especially color products. As a result, quite a number of "substitute" color film processing formulas were worked out by individual experimenters—notably C. Leslie Thompson in Edinburgh—which were published in the *British Journal of Photography* and several other sources. Such formulas gave results of a sort, but rarely as satisfactory as those obtained by the manufacturers and their appointed processing laboratories.

In more recent years "official" formulas have begun to appear for the color products of a few foreign film manufacturers. Ferrania, for example, released some of their color film processing formulas about two years ago. Gevaert became more lenient in this respect also. They recently published a booklet (in English) entitled *Processing Motion Picture Films* that contains complete formulas for their black-and-white negative-positive and reversal cine films, plus formulas for Gevacolor negative, positive and reversal cine films, plus formulas for Gevacolor negative, positive and reversal duplicating cine films. The booklet also includes solution analysis procedures, as well as comments on sensitometric control and the measurement of solution pH.

New x-ray microscopy system

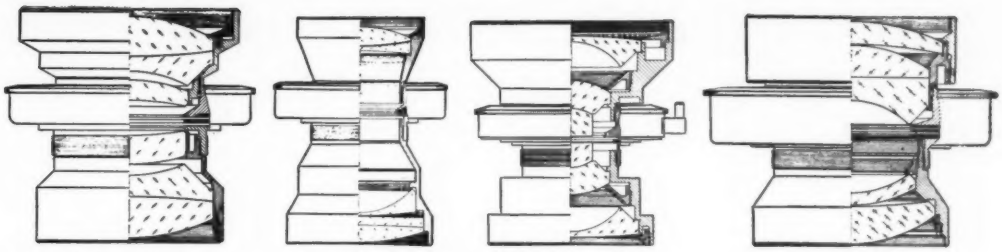
According to scanty descriptions that have appeared in recent months, a new system of x-ray microscopy has been developed at Stanford University which gives results about four times sharper than previously attainable. The basis of the new system rests in a unique light-sensitive material and processing procedure. Dr. Saara Asunmaa, researcher in Stanford's biophysics laboratory reports that details have been resolved by the new system to less than 600 angstroms, which allowed a magnification of roughly 10,000 diameters, in an electron microscope. Now the resolution of the x-ray microscope image will afford magnifications of about 40,000.

Information on the new light-sensitive material and processing method that I have on hand is not easily understandable. (Too bad the details so far published about the system are not equivalent to the system's reported detail recording capacity.) But as I gather, a nitrocellulose solution containing a silver compound is "cast" onto a polished glass surface to form a film thickness of something less than 1000 angstroms, *i.e.*, about 1/250,000 of an inch. The special silver compound forms radioactive substances during exposure in an x-ray microscope which are soluble in a solution consisting of alcohol and sodium cyanide. (Both are poisons, I've been told.) An image of the specimen under study remains which, due to its pattern of varying electron absorbencies, can be examined under high magnification with an electron microscope.

Industrial photographers should not fluff such developments off as mere laboratory stunts of no practical value, because the trend in photo-recording is toward higher and higher levels of performance. Would it not have been better if industrial (or scientific) photographers had already demonstrated how the resolutions required in Dr. Asunmaa's research could be accomplished, so that she should not have to digress from her biological studies to develop a suitable photo-sensitive (or x-ray sensitive) system for attaining her goals?

The English firm of Ademco Ltd., 26 Stamford Street, London, S.E. 1, has introduced a new photo lacquer, Stripmask, with many practical ap-

(*continued on page* 24)



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To Zero in Color, with the EP-1000:

a. You must first have made a satisfactory print by trial and error, and have recorded the color correction filter pack and exposure time. The trial and error negative becomes your "standard."

b. With the "standard" negative in the carrier, set the Probe on easel so that it is looking at an area of the negative which is representative of the color balance you wish to maintain. (Area selected for indexing will be faithfully reproduced on subsequent unknown negatives.)

c. Adjust the exposure knob (E attenuator) to read the exposure time required for the "trial and error" print. (See 1 above)

d. With the appropriate filter in place in the Probe, adjust the red, green and blue attenuators until the meter needle reads zero on the Correction Filter Requirement Scale. (See 2 above) Having made these adjustments, you are now "zeroed in" and ready to analyze similar unknown negatives and to make prints.

For complete literature on the above, the name of a dealer near you who will be glad to demonstrate QuantaLog equipment, address correspondence to Macbeth Instrument Corporation.

MACBETH INSTRUMENT CORPORATION
P. O. Box 950 Newburgh, N. Y.

Get more information. Circle 490, page 87

Samuel Lang & Leonard Zoref

INDUSTRIAL COLOR

Kodak does itself proud with its new color photo handbook

The brand-new *Kodak Color Dataguide* is so jam-packed with useful information that we feel it should become as much a part of your equipment as your exposure meter. In fact, the book is designed as equipment: completely printed on plastic-coated card stock so that it should be able to take plenty of abuse in your camera case.

The first few pages are devoted to all the data on the present still color films manufactured by E.K., a total of 12 now. A cleverly designed four-page affair condenses shooting data for each film, including: processing kit necessary, notching code, speed, electronic flash guide numbers, clear flash guide numbers, photoflood indexes, 3200 K lamp indexes, and necessary filters under all conditions. When a light source with a specified film requires a filter the index given takes the filter into account.

The following two pages cover bellows factors and reciprocity failure. There are two invaluable reciprocity failure tables included, One for E-3 Ektachrome Type "B." The other for Ektacolor Type "L." The charts are far simpler to use than the original Ektacolor L instructions which called for changing the ASA index as the exposure time increases an entangling mental exercise. In the *Kodak Color Dataguide* the entire range of reciprocity failure is computed from one exposure index for each film, ASA 32 for the Ektachrome and ASA 25 for the Ektacolor. In addition bellows factors are included in the table so that the additional exposure necessary is correctly computed.

The next page has complete current filter information. It lists light balancing filters and their factors, the CC filters with the factors; and color absorbing properties; all conversion filters with a brief description of each.

Next in the book, on opposing pages, are a grey card, a mounted grey scale and eight color patches. When the book is open to these two pages it can be included with one of your color negative shots, to facilitate the making of Ektacolor prints. It also can be included in transparency shots when color balancing tests are being made for unusual lighting conditions or when testing a new emulsion. The grey card is also useful for meter readings. Detailed instructions are included for use and evaluation.

Filter recommendations for fluorescent light sources follow this. They've always been a source of trouble for most photographers. The table covers four of the most common type fluorescents in use. An interesting item we noted is that all fluorescents should be allowed to burn for at least 10 minutes because their color changes as they warm up. Included with the above information is complete information on the care and storage of color films. Included is a table that is new to us. Warm up times for films coming from a refrigerator or a freezer for all different types of packaging (rolls, sheets, etc). We're often queried about this.

The following 10 pages are devoted to color processing of all the positive color films (except Kodachrome) and all the negative color films plus Ektacolor paper and Ektachrome paper. The latest information on agitation is included. This has been greatly modified in the past year. Complete replenishment tables and charts are included. Capacities and keeping life of mixed solutions are given. Instructions for increasing the speeds of the E-2 films are also included in this section of the book.

The next section is an introduction to color printing. A unique feature of this section is the inclusion of an envelope containing an original 35mm Kodacolor negative and color print made from a negative shot

(*continued on page* 18)

We Asked Ourselves:

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And . . . as a further professional service—two annual checkup certificates valued at $25.00 each are included. They entitle the owner to free shutter recalibration and camera cleaning and inspection on the 1st and 2nd anniversary of purchase.

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New Beseler C Topcon with 58mm f 1.8 or 35mm f 2.8 Auto-Topcor lens, internally coupled fully automatic diaphragm, exclusive instant reading depth of field "window," click stops and exact half-stops between every f stop, speeds from 1-1/1000 second plus all other major advanced automatic single lens reflex features—$295.00.

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New Kalart/Victor Makes Sound Come to Life in 16mm Programs

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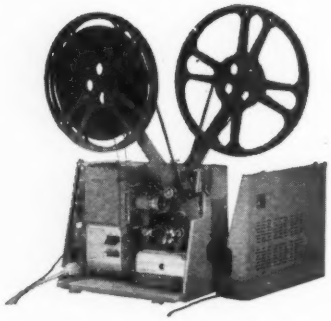

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INDUSTRIAL COLOR

(*continued from page* 16)

under the same lighting conditions. We understand that Kodak made these negatives on a special 35mm double frame movie camera. (If you have a negative of the girl in the picture blinking, write to Kodak for a wide-eyed version. EK found the culling job too much of an eye strain, not to mention the costs involved.) The quality of the small print included is excellent. Illustrations are given of prints with poor color balance and exposure.

A complete explanation of color filtering with the various printing methods used today is included. Another innovation is the inclusion of a complete set (6) of CC10 density filters. Together, they enable the photographer making his own prints to visually correct his prints. Another use of these filters could be the color correction of transparencies. They could give you a quick reference as to the proper filter to use in the event critical color balance is necessary, especially if the transparency includes a grey card. A very handy CC filter computer is also included in this section. This is the same computer that is sold separately by Kodak. Again complete instructions for its use are given. An additional color printing computer is included with some new information on the reciprocity failure of Ektacolor paper. This computer quickly enables the operator to change magnification, f-stop, exposures, density, and exposure for filters. The balance of the printing sections is devoted to the making of Ektacolor Print Film transparencies, Panalure prints, and Ektachrome prints.

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	CAMERA 'X'	CAMERA 'Y'
shutter	between-the-lens	focal plane
speeds	1 sec. to 1/500th	10 sec. to 1/1250th
delayed action	approx. 10 sec.	adjustable: 1 to 10 sec.
lenses	interchangeable only when shutter is wound	interchangeable at any time
each lens requires shutter	yes	no
widest angle lens	60mm f5.6	50mm f3.5
normal lens focusing range	3½ ft. to infinity	19 inches to infinity
diaphragm action	stops down automatically for exposure — must wind shutter to reopen	automatically stops down for exposure — instantly reopens to full aperture.
instant-return automatic mirror	no shutter must be wound to reset mirror to focus position	yes automatically returns to focus position after exposure
film back interchangeability	to replace or interchange backs attention must be paid to whether film or shutter had been previously wound — and appropriate adjustment made	back may be replaced or interchanged without any attention to whether film or shutter has been wound. Camera responds automatically.
film loading	must observe visual indicator when winding to #1	automatically stops at #1 exposure position
safety film-slide	camera can be fired with slide slightly withdrawn (⅛")	camera cannot be fired unless slide is completely withdrawn
film-slide lock	no slide readily removable when film back is off camera	yes slide cannot be withdrawn when film back is off camera
special film flatness device	none	automatic film tension system keeps film flat for exposure — relaxes when film is advanced
auto-reset exposure counter	no	yes
focusing lock	no	yes
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Arnold Eagle

INDUSTRIAL MOTION PICTURES

Broaden your horizon by looking at the work of other film makers

One of the major frustrations that plague every serious film maker is the lack of opportunity to see the films of other serious film makers especially those in the non-theatrical line. Even movie makers in large film centers find it difficult to see even a few of the "worthwhile" efforts of his contemporaries. This is so for two reasons: one, it is difficult to obtain these films; and two, busy film makers feel they cannot afford the "luxury" of sparing the necessary time from their full schedules to be present at a screening. I put the word "luxury" in quotation marks, since I do not consider it a luxury. It is rather, an important necessity, from more than one point of view. I do not mean that a film maker should see only what the competition is doing in his own limited field; I refer to the need to view films in all possible categories and styles; from an abstract experimental film, to one showing a new technique in surgery; from a lip sync dialogue sales film, to a high school teaching film on astronomy. Seeing the efforts of other film makers is as important for the creative film maker as reading scientific journals is for the research scientist.

Film societies

The only real chance the film maker gets to catch up on films is when he takes a few days off once in a while to go to a photographers convention, or, better yet, to a film festival that exhibits non-theatrical films. There are, of course, other ways to see non-theatrical films. Film societies may be found all over the country. They show educational, scientific and experimental pictures. The most prominent of these is New York's *Cinema 16*, under the leadership of Amos Vogel. Its membership rolls contain more than 5000 names and it exhibits outstanding films from all over the world. Its headquarters are at 175 Lexington Avenue in New York.

But of all the various film meetings, I find most stimulating and exciting the annual Robert Flaherty Film Seminar which was held in Brattleboro, Vt., late in August. The seminar is conducted by the Robert Flaherty Foundation, whose main purpose is to encourage creative film makers in their efforts to produce pictures that will contribute to the progress of film as a method of communication and as an individual artistic endeavor in self-expression. A second purpose of the seminar is the perpetuation of the "Flaherty method" of film making. The guiding spirit of the organization is the widow of Robert Flaherty, Mrs. Frances Flaherty, together with her brother-in-law, David Flaherty. They were co-workers and participants in all the Flaherty films.

Robert Flaherty

Robert Flaherty is considered the father of the documentary film. Many famous film makers from all over the world are among his followers. They show up at these seminars and make valuable contributions to the discussions. I consider myself fortunate to have known Flaherty and to have worked with him when he made his last great film, *Louisiana Story*. It was impossible to be with him and remain unaffected or uninfluenced by his dynamic personality, his love for humanity, and his sincere devotion to honesty and truth in film making. The various films he made—*Nanook of the North, Moana, Elephant Boy, Man of Aran, Louisiana Story*—will continue to remain a most important contribution to film history.

Now, about the Flaherty method. Mrs. Flaherty sums it up with the word, "non-preconception", approaching a subject with an open mind, living with your subject until you really know it and letting the story unfold itself from the materials in front of you. This is how a painter works. Sure, he selects his subject,

(*continued on page* 22)

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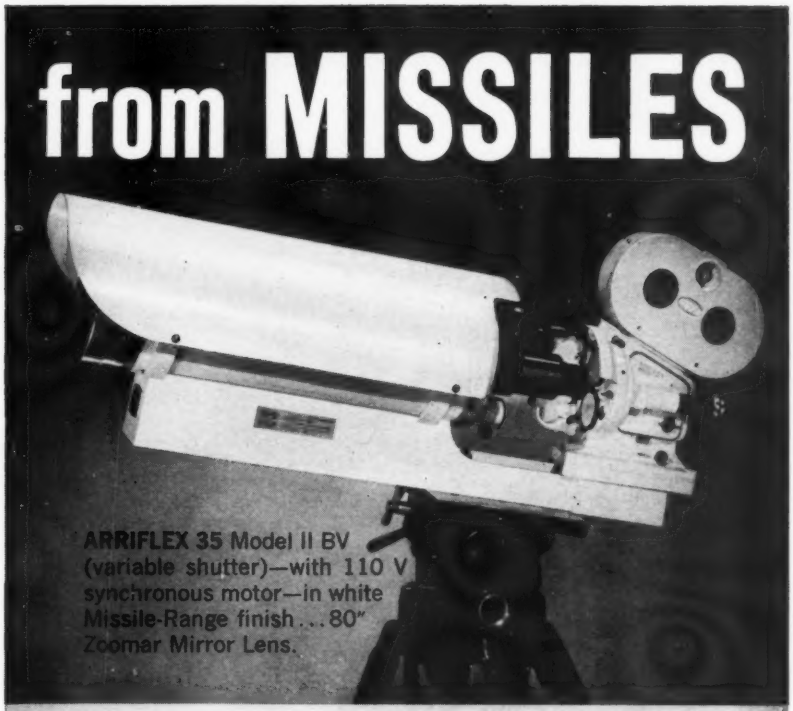

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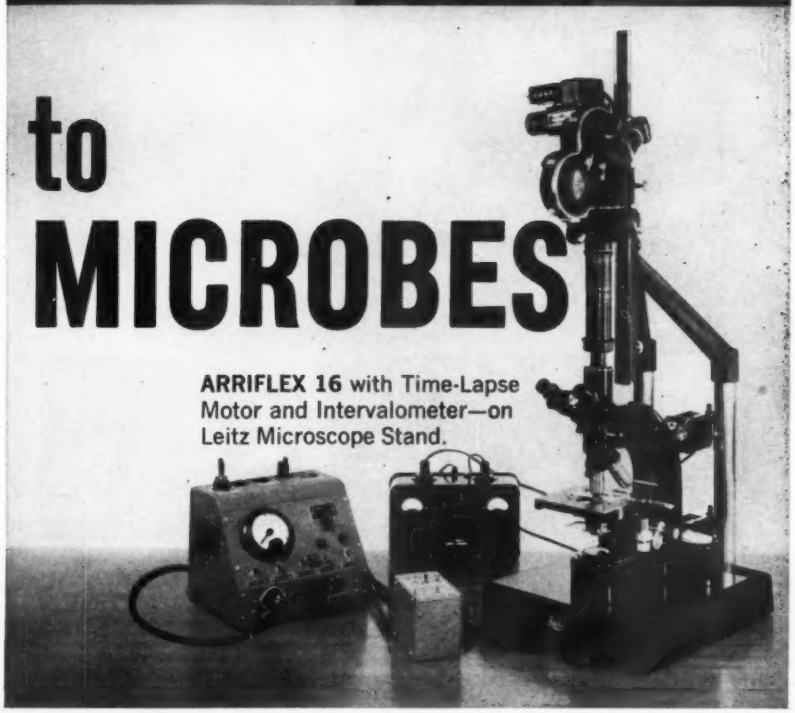

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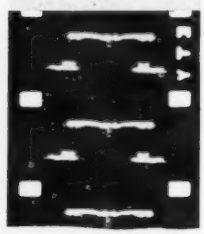
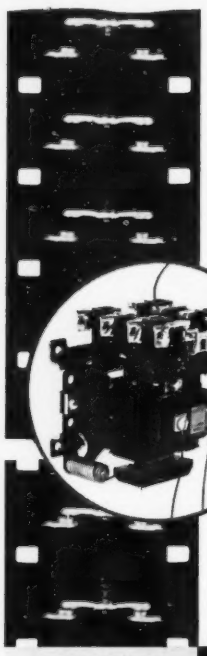
Actual reproductions from FASTAX high-speed films, taken at 7,500 frames per second, used to analyze contact operation.





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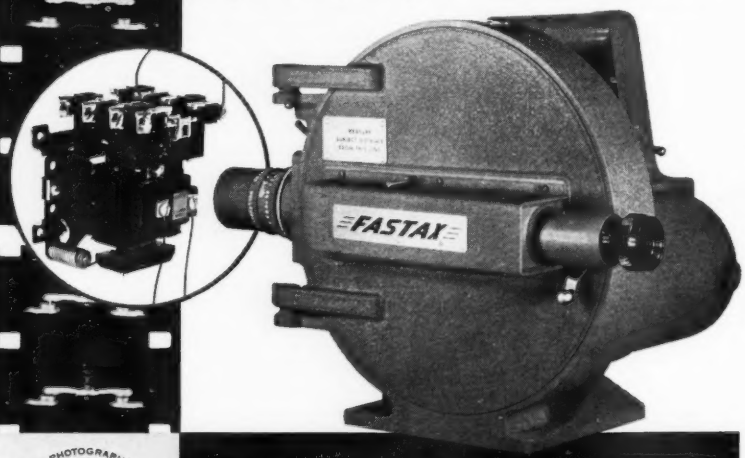

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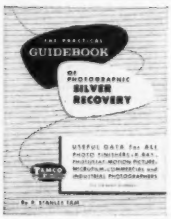

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IND. MOTION PICTURES

(*continued from page* 20)

but as he works on his canvas, he develops his painting. The subject in front of him, and the painting in progress tell him how to proceed and how to finish. This is also how the anthropologist works. He will choose the group of people he wants to work with. He must leave all his preconceived notions behind him, so that he may observe and record the culture before him without distortion. This is how both the explorer and the research scientist approach an unknown subject. The Greek philosopher Heraclitus said it 2,500 years ago, when he declared: "Only those who expect the unexpected will ever find it."

Flaherty was many men in one man. He was an artist, a poet, a wonderful story teller. He had the curiosity of an anthropologist. His profession was actually that of explorer. A mining engineer, he spent ten years in the Arctic, searching for and exploring iron mines in the wastes of northern Canada. He lived among the Eskimos, and traveled with them as one of them. In 1920, he decided to record his explorations, and took some 35mm equipment with him (there was no 16mm film in those days). That is when the idea came to him to make a film record of these people whom he admired and loved.

First documentary

Never having been spoiled by Hollywood's preconception that a film must have a story, and a cast must consist of trained actors, Flaherty was sure that a real drama of man's struggle for survival against nature, acted out by the actual people, would interest people from all over the world sufficiently to make them willing to pay the admission price to see the movie. And he was right, of course. Thus the documentary film was born, in 1922—*Nanook of the North*. Flaherty never worked from a prepared script. He had a general story line; and he made changes as the story developed. He never hesitated to discard weeks of work if he felt that the footage did not work effectively in the finished film.

An interesting addition to the Seminar's curriculum this year was the Louisiana Story Study Film. Five-minute segments were isolated from the finished film, and shown together with one hour of the outtakes from which they were selected. This gave the viewers some insight into the way Flaherty developed his

(*continued on page* 104)

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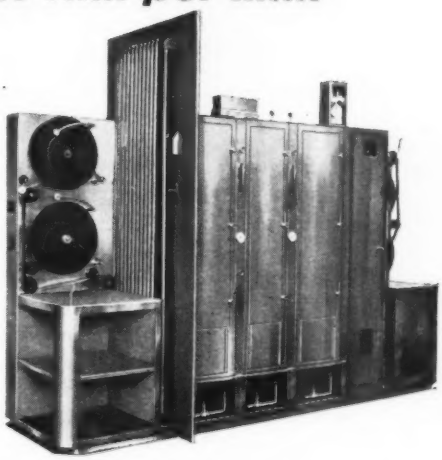

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METHODS FOR TOMORROW

(*continued from page* 14)

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I should mention, as a final word on this product, its instant removability. One simply attaches a strip of cellulose tape to the Stripmasked area and pulls sharply. No solvents are required, and this operation, too, can be performed while the emulsion surface is still damp. For further information, write: Ademco Ltd., 26 Stamford St., London, S.E. 1, England.—THE END

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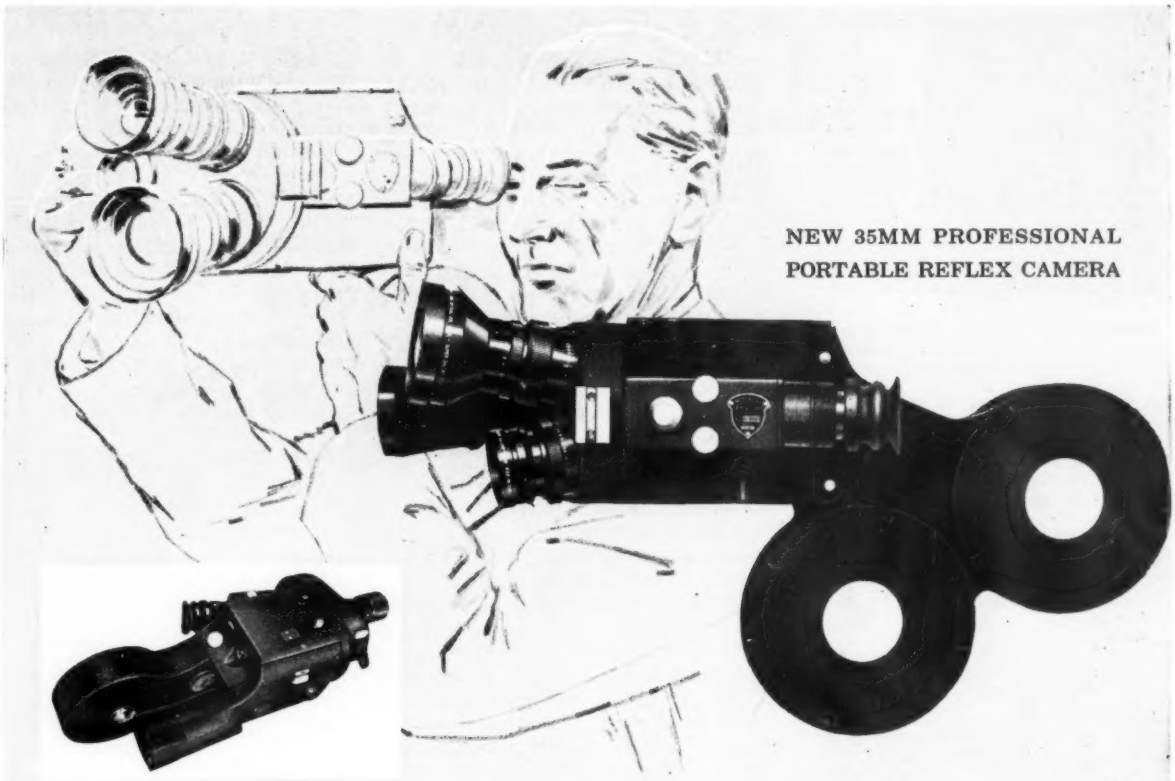

This camera produces steady, brilliant pictures through its use of dual registration pins and dual pull-down claws. A special series of Super Baltar matched F 2.0 lenses were specifically designed for the R-35 by Bausch & Lomb. Variable opening disc shutter provides positive exposure control. By means of a simple adaptor the R-35 can be used with standard Mitchell 1000′ magazines for tripod mounting. These are but a few of the outstanding professional features that make the Mitchell R-35 a major cinematic development. Send for the new R-35 Bulletin. *Tripod adaptor and blimp available as accessories.

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Ernest E. Reshovsky

PHOTO INSTRUMENTATION

Elements and aspects of photo instrumentation systems: part II

Last month this column gave extensive space to a talk delivered by Amron Katz of the RAND Corp. to the SPIE Technical Symposium. Katz dealt with down-to-earth aspects of photo instrumentation in such a concise manner that we feel a few more quotes from his very important talk are in order. The remarks below cover some of the practical problems which have arisen in the field.

"We can discuss the case of an observatory on the moon looking at the earth. Assume the problem is to resolve 20 feet on the earth at mid-latitudes, say 45° north or south. Simple application of a few basic rules leads in essentially straight-forward and incontrovertible fashion to requirements for photographic instrumentation which, if 100 lines per mm combined performance is achieved, requires a perfect lens approximately 400 feet in diameter and a focal length of about a half mile. Coming in much closer to the earth, it is possible to put a satellite at such a position that it is always above the same point on earth. This requires that the satellite have a period exactly that of the earth, about 24 hrs., and it turns out this satellite is at an altitude of about 22,300 miles above the earth in a perfectly circular orbit parallel to the earth's equatorial plane, and moving in the same direction as the earth. What could we see on earth if we put the 100-in. diameter Mt. Wilson telescope in this orbit? By application of simple rules and again taking the example of 100 line per mm performance, one is led to conclude that ground resolution would be of the order of 100 feet."

Photography displaced?

Going on to other subjects, Katz continued: "Is there not a danger of photography being displaced by a new and more modern system, such as television or other electronic systems? The instrumentation engineer should properly answer that he could not care less, that the more or less open competition of the market place will insure that the best system for a given application will eventually be used. He will feel that overall criteria of efficiency, effectiveness, availability, and other relevant factors, too numerous to list, will see to it that if something better for a given application than photography comes around, it will be used. I quite agree with this view. Photography for its own sake is a non-supportable proposition. But the photographic instrumentation engineer who at the same time has an appreciation of, and love for, photography, should see to it that competing techniques are pushed to the limit before they are allowed to triumph. The information storage capacity of photography remains tremendous.

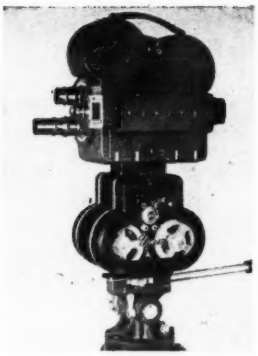
Simple example

"Consider a simple example deduced from consideration of observation satellites. Let us assume we have a single 9 x 9-in. photograph of the ground secured in a satellite, and that the resolution of this photograph is approx. 100 lines per mm uniformly over the format (a not impossible task in the reasonable future). By methods of information theory it can be shown that there are close to one hundred million bits of information on this photograph. Not only can excellent definition, resolution, or information storage be secured on film, but the time storage properties of film are important when used either to integrate information, or take photographs at hundreds or millions of frames per second. Television systems are not as yet capable of resolutions anywhere near that available photographically. The television format size is small, say one square inch or less. Now 9 x 9-in. photographs are not the largest that have been taken.

"On my office wall I have an aerial photograph, a single sheet, 13 feet long by 18½ inches wide, taken by an aerial panoramic camera. In fact,

(*continued on page* 28)

Nomad/Arriflex



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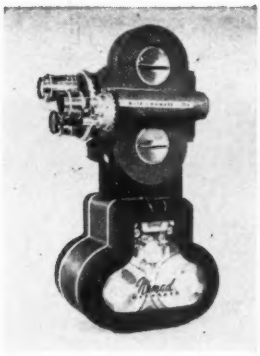

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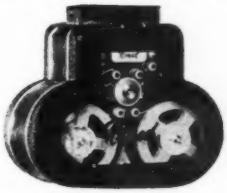

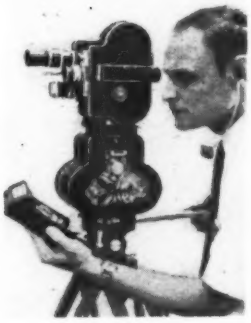

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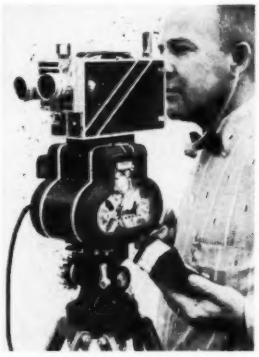

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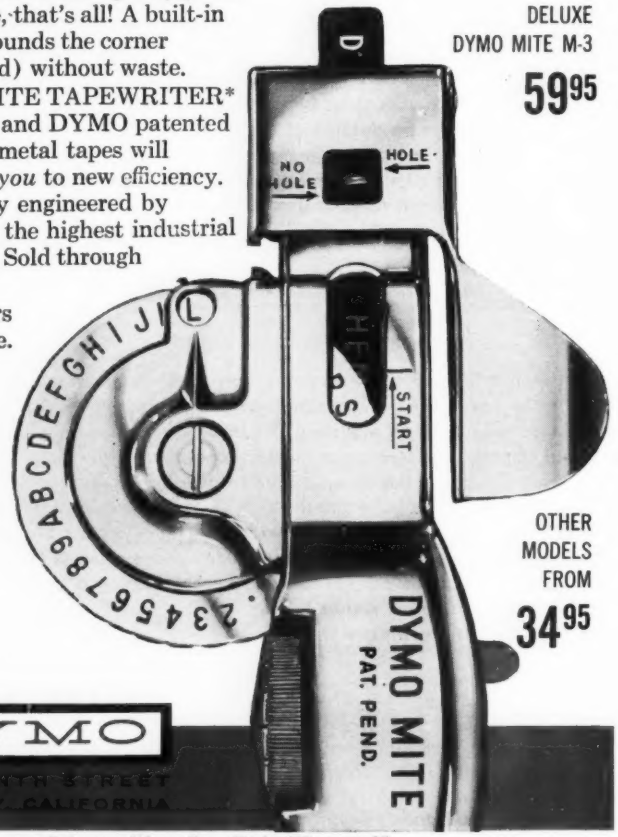

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(*continued from page 26*)

in 1906 a truly fantastic pioneer in this business, George Lawrence, took a photograph of the San Francisco earthquake and fire from an assemblage of balloons and kites. This photograph yielded contact prints eight feet by four and a half feet."

The future

Speaking of the future, Katz said: "What are the challenges ahead? The most obvious, perhaps the most glamorous, but certainly not the only challenge which lies before photographic instrumentation engineers has to do with the space frontier--observation satellites, lunar exploration, close-up photography of the planets are all distinct possibilities which may be realized within the next few years. I noted earlier the possibility of putting truly huge photographic systems in orbits at distances of 22,000 miles. Were this same instrument properly mounted in a satellite at 500 miles altitude, we could resolve one-foot objects on the ground. Hopefully in the next few years, the world will be completely mapped by distortionless optical systems carried in satellites. In this case the film may be returned directly to earth. This would avoid subjecting it to the possible degradation of geometric fidelity which could result if the information were sent back by some sort of TV readout and transmission systems. Perhaps the most important application of observation satellites in the future, which might well be the most important application of photographic instrumentation in the future, will be to keep the peace. . . .

"The most important point which I can possibly leave with this group is the thought that novel problems cannot be solved from handbooks or by reference to previously published solutions to different problems. They require imagination, technical competence, training, and a full knowledge of the techniques and components of photographic instrumentation."—THE END

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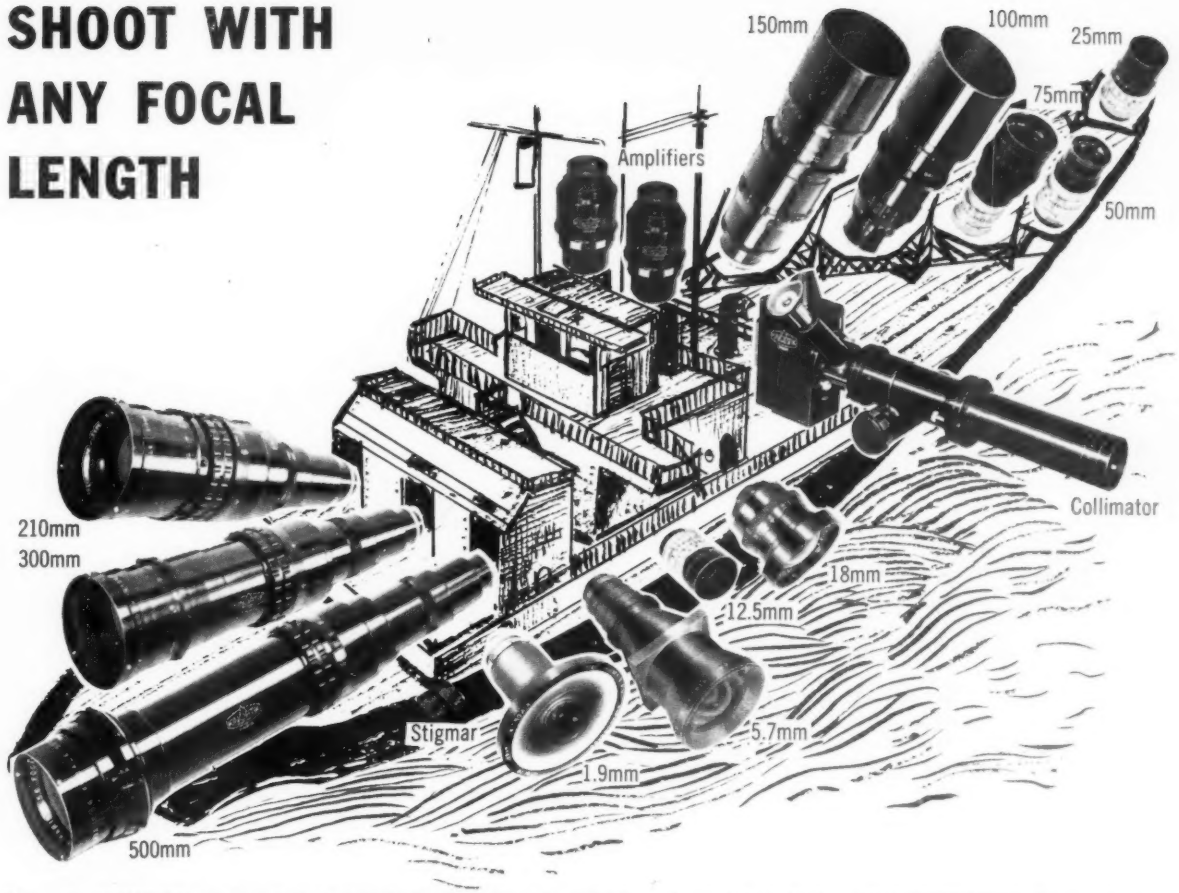

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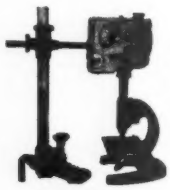

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AN EDITORIAL

SMALL ONES HAVE TO BE BEST

At one of the hair-down, talk-it-up sessions of the PPofA's most recent National Industrial Conference, a photographer posed the question, "What is the proper role of the very small in-plant photo department?" The answers are worthy of print. ■ The small department must above all concentrate on quality. Almost per se, it has nothing else to "sell." It cannot produce a great volume, it cannot give super fast service or produce at minimum cost. Therefore it can establish itself only as the source of truly professional photographs. It very nearly must do this. Without a show of elaborate equipment or a phalanx of specialized and varied skills, it has nothing to advertise its worth except the quality of the product. And being small, its members are likely to be viewed as individuals. As such they are vulnerable to comparison to amateurs within the organization and to outside sources of photographs. The maxim about being only as good as the last print can be true to a crushing degree. ■ Nobody's a superman, so the small department needs to be very skilled in the use of an important tool, the little word "no." It is forced to turn down any job it cannot handle professionally and on time. ■ Still it must serve its company's needs, which very probably call for a much larger and better equipped group. Therefore each man in the small department must know more than the man in a larger unit. He must keep on top of developments in applications, in processes and in tools, because lapse of knowledge in his speciality can cut his prestige to ribbons. If on the other hand, his answers show as much quality as his work, more than likely he's on his way to better things (like budgets and staff). Naturally, a firm with a small department is going to need outside services from time to time. If these are channeled through the department instead of around it, the department is on a firmer foundation. And that's precisely what it needs, a bedrock foundation for future growth.

The Editors

HIGH SPEED AT M.I.T.

Dr. Harold Edgerton, mid-wife to electronic flash

"Learning the art of high-speed photography," remarked Harold Edgerton, "is like learning the art of violin playing. You can read all the books on theory and you can enjoy the end result but there's nothing like first hand experience with the equipment."

With this statement, Edgerton, a professor of electrical engineering at Massachusetts Institute of Technology who is considered by most authorities to be the father of high-speed electronic flash techniques (although he admits to being no more than a midwife), introduced the Conference on Techniques in High-Speed Photography and Electronic Flash, August 15 to 19, at MIT, Cambridge, Mass.

Attended by more than seventy of the leading technicians in the field and using a staff of instructors who were specialists in the more exotic technologies involved, the week-long seminar was considered successful and rewarding. The group covered such erudite aspects of the art as *Optimization of Space and Time Resolution; Theory of Electronic Flash; Sensitometry in the High Speed Regions; Theory of Rotating Prism Cameras; Electro- and Magneto-Optical Shutters.*

Perhaps the outstanding feature of the course was a series of 17 experiments in which the entire group, divided into small teams, participated. Massachusetts Institute of Technology has had a campaign recently to re-name experiments "experiences", the purpose being to reinforce the concept of experiencing and doing, rather than to call the learning process an experiment with its connotation of testing, or trying. The "experiences" set up for the high-speed group were fascinating, well planned, and gave each participant an opportunity to be more than a mere observer. Actually operating each of five or six different kinds of high-speed motion picture cameras and making pictures of the closing of a mouse trap, for example, gave the students first hand acquaintance with loading and operating of various makes and models of camera. Since a good deal of the ultra-high-speed gadgetry is used in ballistic work, there were many set-ups where photographs of bullets were made. Polaroid very kindly offered film and the new Polaroid cut-film holders for use by the bullet-catchers. Everyone with a bit of patience and luck was able to take home pictures of multiple flash techniques (eight exposures of a bullet in flight almost touching), double flash pictures (how far and how fast

does a projectile travel; how much does a target which it penetrates slow it down?); as well as spectacular souvenir pictures of playing cards being shot in two edge-wise (thanks partly to the expert marksmanship of an Edgerton graduate student, John Tredwell, who was official gun-aligner).

One of the most encouraging things about conferences of this sort is that within a few hours practically everyone is talking with everyone else, exchanging ideas and comments, telling of problems encountered in his own field and sharing other experiences. Behind the charm and sly wit of Dr. Edgerton is a great flair for showmanship and a love of humanity. Not only did he collect a fine staff of experts and assistants, but he managed to balance the program with examples of high-speed work (movies of atom bomb blasts, studies of machine action, etc.).

One of the highlights of the sessions was a night at the M.I.T. gymnasium where, with their own cameras, spectators were invited to make stroboscopic pictures of tumblers on a trampoline, badminton players, baton twirling, and simliar subjects.

Although scheduled a week after the National Industrial Photographic Conference in Chicago, there were, nonetheless, a surprising number of students who had been at the Chicago meetings. This would seem to show that when well planned and carefully designed programs are available, there are always enough interested participants.

It would seem that this might set a good example for other university groups, engineering societies, photographic manufacturers, and others interested in stimulating a greater understanding and wider use of functional photography. Carefully scheduled with competent leadership, there is no doubt that a full registration could be expected in almost every field of photography.

It is a particular tribute that Dr. Edgerton had substantial over-subscription to his sessions; the total limit of enrollment was stretched several times. Dr. Edgerton himself was not the only attraction, of course, but in addition to being a fine scientist, a prolific and imaginative inventor, and a stimulating educator, he is universally loved. At the banquet ending the Conference at M.I.T., he was presented with a scroll signed by all participants. Among other tributes it read, ". . . with appreciation, admiration, and affection."

—David B. Eisendrath, Jr.

Electronic flash and its techniques applied to high-speed pictures by M.I.T. experts

Edward Farber

Last month, some seventy photographers and a staff of thirty-two instructors gathered at Massachusetts Institute of Technology for a five-day seminar on Techniques in High Speed Photography.

It is no small tribute to course organizer Dr. Harold Edgerton, or to those who work in this field that many more than could be admitted sent in the $175.00 fee. The enthusiasm with which everyone went through the fifteen experiments ("experiences" Edgerton preferred to call them) is an equal tribute to the course content and the participants' zeal.

About half of the program was exclusively electronic flash. Here, Edgerton was assisted by long-time assistants Fred Barstow and Charles Wyckoff, graduate students John Tredwell and David Cahlander, and lab assistant Bill McRoberts. Because these people were practical photographers as well as engineers, the program produced a maximum of

(*continued on page* 34)

Observations and assorted comment on high-speed as a whole, electronic flash as a part

D. B. Eisendrath, Jr.

To many people, the term high-speed photography means photography made with electronic flash equipment. They are partly correct. There is, however, much photography which is high-speed but which is not made with electronic flash. All electronic flash photography is not high-speed: it may be slower than high-speed, or it may be faster than high-speed.

This quibbling of terminology may sound petty, but inasmuch as I have waged a long-time campaign for better *photo semantics*, a good definition of terminology makes for more accurate scientific reporting.

At the recent Conference on Electronic Flash and High-Speed Photography held at M.I.T., I gave a talk on the history of the high-speed field, and presented a chart with my paper which may be of interest to you.

From my notes taken from the conference, I have made a lot of miscellaneous references that might

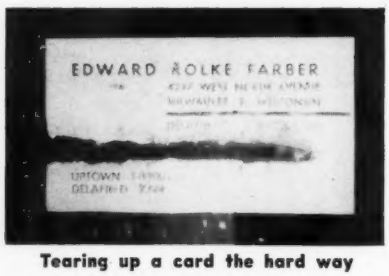
(*continued on page* 35)

meaningful material during lectures, demonstrations, and bull sessions.

Discussions that originated after a lecture session continued down the hallways, down the street to the refectory, along the cafeteria line, and prolonged the lunch hour. Many came back to the labs for additional work during the evening hours. It all points up the fact, as Dave Eisendrath mentioned in his talk on the History of High-Speed Photography, that "after 109 years the problems are pretty much the same and the technique of capturing information, although refined, is still basically challenging."

The energetic and enthusiastic Edgerton, who took up this challenge over thirty years ago, still pursues it with an enviable, youthful enthusiasm. He was everywhere, keeping associates active, experiments operating, and replying to questions with "why not try it and see what happens . . . you can get the equipment from . . . over there."

One of the most popular experiments involved the use of a new Edgerton Germeshausen and Grier submicrosecond flash. A thirty caliber Springfield clamped into a rack was bore sighted on a steel wire. A microphone picked up the sound for the first flash. A phototube with a built-in time delay picked up the light from the first to fire a second flash. The delay was adjusted to show the bullet before and after it has hit a steel wire. Splitting calling cards became a scientific project. Four by five film was provided by Polaroid so results could



Tearing up a card the hard way

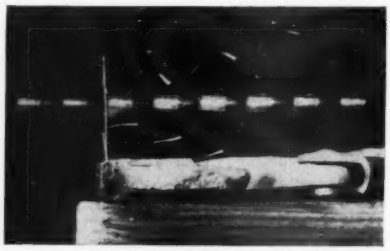
be observed without delay.

This submicrosecond flash uses a new "flash tube" design which really could be described as an air flash. The trigger electrode is run down the center of a thick-walled glass tube 6mm or so in diameter. Two copper electrodes which are just loops of the lead wires around the glass tube are spaced about ¾ of an inch apart. The spark follows the surface of the glass.

Air makes the best medium for short duration flashes since its deionization time is short and no long tail results. Xenon, for example, has an afterglow that lasts for several microseconds.

This guided arc air gap flash unit used a .005 capacitor at 18,000 volts and produced about 1/3 microsecond flash.

Equally exciting was the EG&G Multiple Microflash unit which used fifteen separate energy storage units to produce fifteen separate pulses of light, each with a duration of about one microsecond, with 1.5 watt-seconds per flash and a time interval of 10 microseconds to 10 milliseconds between flashes. This formidable



Studying the path of a bullet

unit stands five feet high and is obviously not intended to be carried about the lab.

General Radio's new 1531 A Strobotac, though designed principally for visual observation, puts out a bright white light from a new EG&G Strobotron tube at frequencies from 2 to 420 per second. It can be used to measure speeds to 250,000 rpm but serves well as a single flash device with durations of 3.6, 1.2, or 0.8 microseconds, depending on which of three intensities are used.

The beam angle is only ten degrees, but guide numbers of 89, 45, and 15, respectively, were satisfactory with 3000 Polaroid film to photograph splashes in milk. The drop interrupted a beam of light falling on a photodiode. This pulse was amplified, put through a delay circuit and used to trip the GR Strobotac.

A magneto-optical shutter in which the plane of polarization of a piece of glass is rotated by means of a high voltage pulse from a capacitor was set up so that the growth and decay of the glowing gas in a flash tube could be observed by timing the flash to fire at different stages of the arc formation. It left the observers with a feeling that flash is sort of a sluggish thing after all.

Other "experiences" involved use of the General Radio-Ascor exposure meter, the cathode ray oscillograph to measure flash intensity and duration, shock wave photography using a black Scotchlite screen as described in a recent column, and a high-speed stroboscope operating at 1000 cycles per second. There were fifteen "experiencs" in all, and afternoons were almost entirely devoted to these.

Lecture sessions were factual, practical, and couched in simple, straightforward language refreshingly free from the pseudo-erudition of so many of the "papers" presented at conventions.

Edgerton emphasized accurate control of the flash instant, and ample spark voltage, or energy, in the triggering circuit. This observer was struck by the fact that all his lab. equipment used large, model-airplane-type, spark coils. None of the small commercial trigger coils were ever in evidence.

In discussing the design of flash tubes, he pointed out a most convenient method of looking at what happens in the tube. If a four-inch long tube of a particular diameter has certain characteristics when operated at 1000 volts at 50 mfds, we can predict the behavior of an eight- or twelve-inch tube, for example, simply by regarding it as made up of two or three such systems operated in series. Thus a similar twelve-inch tube with 3000 volts across it and three 50 mfd capacitors in series (16 2/3 mfd) would have the same characteristics per running inch as the four-inch tube. This method fails when applied to very short fat tubes.

Charley Wyckoff's session on sensitometry demonstrated that reciprocity failure in high-speed panfilms can properly be compensated for by developing for increased contrast, though this procedure did not properly compensate for such failure in slow and medium speed films. Microfile films were as fast as Tri-X at very short durations.

Stanley Slomski of General Electric's Nela Park Flash Lamp laboratories pointed out that there are only two critical problems in using a flash lamp . . . "Turning it on and turning it off."

Ignition of the flash may take only microseconds, but sometimes can ex-

(*continued on page* 103)

EISENDRATH (*continued*)

be of interest to you not only for high-speed work, but for other types of photography as well. In disorganized order, and as they were given, here are some gems for your note books.

Single Image Photography

Fast ..... 1/100 to 1/2000 sec.
High-Speed ..... 1/2000 to 1/50,000 sec.
Ultra-High-Speed ..... 1/50,000 and less

Multiple Image Photography

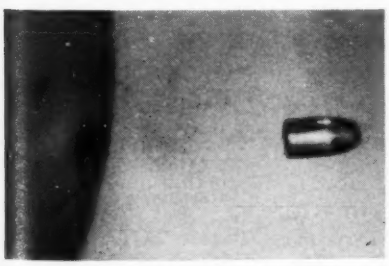
Slow Motion ..... 64 to 3000 images per sec.
High-Speed ..... 300 to 10,000 ips
Very-High-Speed ..... 10,000 to 500,000
Ultra-High-Speed ..... 500,000 ips and up

Harold Edgerton says that in recording pictures of atomic blasts, use of adequate sheathing and radiation-resistant film will help to prevent radiation fogging. Shooting the image off a mirror helps get the cameras out of direct line of radiation, too. The use of lead boxes which snap closed immediately after exposure are also recommended. Best thing to cut down on radiation is distance! Instrumentation photography of atom bomb blasts is most frustrating since you sometimes can't get to your cameras or film for days after the event.

If you're measuring photographic sensitivity to an electronic flashtube and using a photocell to measure with, remember that most photocells are more sensitive to ultraviolet than films are. Use a glass filter over photocell so it measures more of the photographically actinic light, closer to amount of useful light that will affect the film.

In accurate work, any exposure of less than 1/1000 of a second has a noticeable and measureable reciprocity failure effect.

When using Polaroid films to make tests on set-ups, be sure that temperature and humidity are noted since they affect development and contrast and you may want to make comparisons for future testing.



Balloon-busting bullet in flight

Bob Shoberg of Beckman & Whitley commented that when he worked for Wollensak, someone once ordered three of the units Wollensak calls the "Goose," used for starting and timing high-speed cameras and events. Bob says the order asked for three Geese, then this was crossed out and three Gooses written in. Finally the order said, "Send a Goose. And another. Oh yes, might as well send a third one, too. . . ."

Eastman Kodak makes a special perforation on film for those using the Dynafax High-Speed Camera. This camera lays down two rows of images on each side of a 3-ft. length of 35mm film, which is later split and can be used as two 16mm strips. EK makes a film with three rows of perforations, the last one down the center. By using a special slitter that Beckman & Whitley makes, an exposed and processed strip can be split into two perforated 16mm strips, and a narrow strip of one outside perforation discarded. Seems to me, too, that if you needed 16mm film in an emulsion not regularly coated on 16, you could do-it-yourself with this gadget. The triple-perf film is available in $100 minimum orders from Kodak, or from B & W in smaller quantities.

Mentioned this before in my columns, but still a cute trick: Bob Shoberg mentioned that when focussing critically on close-up subjects for high-speed work, quick stunt is to use a dollar bill and focus on the fine engraving lines. (For the $89,000 ultra-high-speed Beckman & Whitley Model 192 Framing Camera a hundred dollar bill would be more appropriate!)

More wit from Shoberg after trying to explain the complex optical system of a high-speed camera: "High-speed photography is sometimes like religion. I don't really understand it—but I have faith."

John Waddell pointed out that in close-up photography with high-speed motion picture cameras, a set of supplementary lenses for close-up work is often a great time-saver and easier to use than extension tubes in many cases. John has used them for pictures up to 10X with good results. Waddell also recommends doing test set-ups with close-up lenses and a tape measure so you know just where to set focus with basic lenses and these supplementaries. He certainly sets up and is ready to shoot in no time using this trick.

Baton twirler seen by high-speed strobe

Reciprocity failure is particularly noticeable in the ultra-high-speed ranges where the films have pronounced fallibility, anyway. Waddell comments that when cameras are in hot sun or very cold areas, watch even more carefully lest reciprocity failure be more acute. Keep your cameras protected against extremes in temperature when they are loaded. Also note that hot sun on long lenses and lens mounts can alter focal length slightly—enough to make a difference if you're doing critical quantitative analysis. Waddell's classic book *Photographic Motion Analysis* has tables for determining effect of heat on focal length.

When working with high-speed films, it is especially important to have quick capping times for supplementary shutters because of the possibility of fog by ambient light. When shooting some ballistic pictures in daylight, techniques used include shooting through long black stove pipe with black paper on each end, photographing through center window into pipe. In this way the only ambient daylight is that which comes through bullet holes in ends, holding ambient level low.

In the ultra-high-speed regions, reciprocity failure has different effects on various films. Much of the high-speed work done at M.I.T. is shot on Fine Grain Positive film—normally very slow, but to the blue light of a xenon flashtube, very responsive. At short duration exposures, it is sometimes better than films with normal speeds many

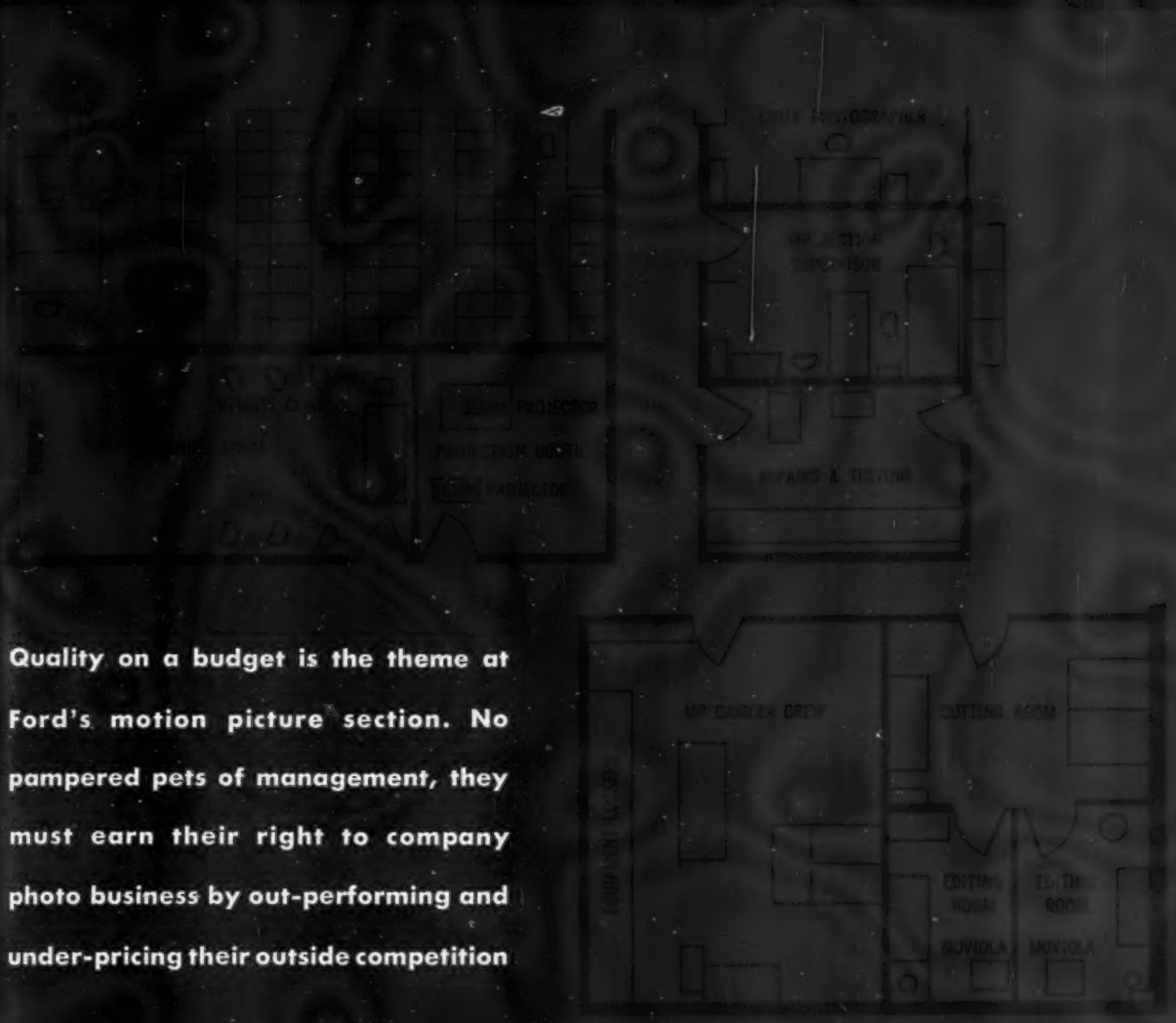
(*continued on page* 102)

As far as Ford Photographic's Film Services Section is concerned, an in-plant unit has a hunting license, not a game preserve, when it comes to meeting the photographic needs of the company. Singing their theme song, "Anything They Can Do We can do Better . . . and Cheaper", Ford Photographic's department representatives compete for the right to meet the photo needs of Ford on the basis of quality and price. Since nobody in the company is required to use Ford Photographic unless they beat out any and all competition, this makes for a highly efficient, well-managed section whose specialty is quality on a budget.

All photographic and reproduction activitics are grouped under Ford Photographic and Printing Department. Sections within the department include Creative Writing, Slidefilm and Motion Pictures, Graphic Arts, Photo Lab Services, Photography and Blueprint, Printing and Distribution. There are over 200 people in these sections doing a combined annual business of about $5,000,000. Apart from the economy offered, Ford sections offer security, both company and government. Each job shop has people who have government clearances for "secret" material.

Ford Photographic's Film Services section operates on a break-even cost system. This means that the money received from their in-plant customers must be enough to cover their expenses within a fairly narrow range. Under this system, if a photo section is losing money, the section chief knows they are not charging enough. If they are making money, they are charging too much. If they are charging about what outside services would cost and are still losing money, the section chief knows that something really is wrong.

In a sense, a break-even system, like a price



Quality on a budget is the theme at Ford's motion picture section. No pampered pets of management, they must earn their right to company photo business by out-performing and under-pricing their outside competition

system, is almost self-regulating, especially when it must compete against outside suppliers. Within a very short time, drop-off of in-plant business, and billing losses, give warning of something wrong. In most cases, the problem is in cost accounting. At Ford, however, this situation is avoided by careful records and planning which enable the photo manager not only to keep close watch over costs but to bill his customers properly so that billings do cover expenses. The efficiency of the section is such that they can compete successfully with outside suppliers on the basis of both price and quality.

In computing costs, straight-time hourly rates are used. These hourly rates include straight-time, overtime and fringe benefits. By using a standard hourly rate, computing costs are simplified. Rates range between $5 and $10 per hour, depending upon the job involved.

Another factor in efficient management is maintaining a manpower level for optimum operation. At Ford, this level is based upon normal work loads. Peak loads are taken care of by giving some of the work to outside groups. Were enough people for peak loads carried, the overall wage cost would be higher than would be economically justified, since many non-productive hours would be racked up waiting from peak to peak.

About eighty per cent of the total time recorded for section personnel is productive time, and it is on this basis that costs are estimated. The remaining 20 per cent includes such chores as setting up, transport and travel, etc. Needless to say, accurate records are kept of each person.

Film Services is one of the sections within the department, offering complete motion picture and slidefilm production facilities, from writing the script to delivery of the film. The only movie work

Script conference. The motion picture section and the customers discuss every aspect of the script before it is approved for production. Basic problem is to give the customer what he wants, yet keep within the budget.

not done is film processing. The intermittent work loads would make the installation and maintenance of movie processing equipment uneconomic. Virtually all other work, however, uncluding direction, writing, recording, artwork, and distribution services are supplied by sections in the department.

To handle this work load, the ten men in the section have a variety of equipment ranging from 16mm Arriflex, Cine Kodak and Filmo cameras to 35mm Mitchell and Eyemo, Moviolas, dollies, lights, tape recorders, studio, station wagons and all the myriad paraphernalia which make up a film production unit. Every piece of equipment was chosen to meet a specific need. In so budget-conscious a section as Ford, there is no room for equipment collectors. Now in the process of installation is a Portman animation stand which will increase the scope of Film Services, permitting it to offer a product which is now only available from sources outside the company.

About 50 per cent of Ford films are in color, including most of the Public Relations productions. Films made in black-and-white are shot on Tri-X and Plus-X. Processing is done by an outside lab since the cost of maintaining a processing lab capable of handling both color and black-and-white would be more than the cost of similar services done by a commercial lab.

The trend toward centralizing and broadening services available is a by-product of a recent reorganization of Ford Photographic. Formerly, Public Relations Staff, Advertising Staff and the Research Staff maintained separate photo departments on the theory that the type of work done in each group was specialized enough to warrant this division. However, the inevitable growth occurred in all departments until they began competing within the company for jobs. The net effect was a tendency toward expensive duplication. Last February 1st, all photography was centralized and put under Engineering. This offered not only one single source of photo service, but permitted Film Services to broaden the range of production operations. Artwork, typesetting, script writing and distribution, formerly bought from outside sources, are now offered within the section. This makes possible a more advantageous competitive position, a larger and more even work load and more efficient service.

Supervisor of Film Services is John P. Breeden. The staff includes: Chuck Livingstone, director; Lane Kemper, Pat Powers, Bill van Idour and Wilson Davis, cameramen; John Holowaty, editor; Rex Pollock, production coordinator; Don Schicker, projectionist; Dean Witt and George Theodoran, slidefilms and animation. The films they turn out range from time study and engineering research to award-winning shorts on the auto industry, safe driving, American documentaries and travel.

The history of motion pictures at Ford begins in 1914 when the first photographer was hired by Henry Ford. In 1917, the most ambitious motion picture project in industry began with the establishment of Ford Newsreel. It was distributed through the Goldwyn Distributing Corporation to 3,000 theatres, viewed by an audience estimated

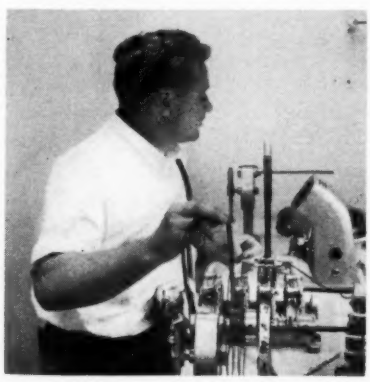
at 5,000,000 people. At one time, Ford was the largest single user of 35mm raw film stock. The Ford Newsreel was discontinued during the twenties but the audience appeal of Ford films has not diminished. In 1959, an estimated 34,000,000 people saw Ford films in schools, clubs and other group showings.

The current Ford film catalog lists 31 films available for sale or loan, 13 of which are products of Film Services. The decision between giving a film assignment to an outside producer or in-plant production is based upon various considerations. Very often, an outside producer will present an attractive idea for a film. Sometimes, Ford will want a certain writer who is available only through an independent producer. There are times when the film must be made on location at a distance from Dearborn and it may be better to have local people do it than send a full crew from Dearborn. Although budgetary considerations are important, since the customer pays for a film out of his department budget, the basic criterion is quality.

One of the important jobs done by Film Service is to find ways to maintain quality and stay within their customer's budget. According to John Breeden, the best way of economizing is to tailor the script to the budget. Quite often, the script calls for extra or elaborate scenes which can be omitted or simplified. Barring script changes, other methods include using fast films to save on lighting costs and using stock footage from older films. Often, a film will be updated by merely changing one or two scenes which show older model cars, for example. One film, which called for a scene on a California throughway, was changed to permit filming a Detroit expressway. Sometimes a film will be shot in two places, doing interiors and some location footage at Detroit and hiring a local crew for distinctive scenery, such as the Rocky Mountains, or a coastline. Breeden emphasized the need for a flexible approach and a

Location shooting. This scene is being shot for a public relations film on the state police departments.

Change of pace. New cars on the Ford test track are being photographed for an engineering film for company use.



John Holowaty learned editing at Ford to become top technician.

Editing film at the moviola, a job formerly done outside Ford.

Customer reacton. This is a preview of a new film shown in the moviola.

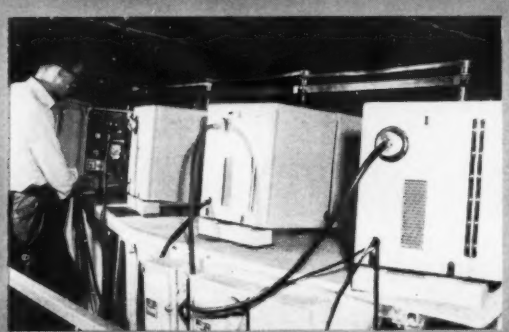
FORD (*continued*)

3-D WIDE SCREEN

One of the most ambitious projects ever handled by Ford photographic was a three-dimensional sales film made in 1956. Using four screens, the film, called Quadrivision, was one of the first wide screen films ever made. Special viewing glasses were worn by the audience during the performance, a necessity with the early wide-screen 3D processes. Without glasses, the image on the screen would be blurred and overlap slightly.

The film was made in a special camera designed by Norling. This film was then edited as four simultaneous films, projected by four coupled Eastman Pageant projectors. The director of this film was Chuck Livingston, of Ford, although the script was written by a free lance.

Quadrivision was a portable presentation set up at various gatherings. The audience observed four screens, each screen receiving the image from a particular one of the four projectors. Action took place either on all four, or on one or two, as the story indicated. Thus, for example, a character would step from screen #1 to screen #2. Screen #1 would then go dark until such time as the action moved back to it from screen #2. It was a very effective presentation.



Quadrivision projectors with coupled drives

This is what it looked like to the audience

clear understanding of what the customer wants.

Liaison between the customers and Ford Photographic is supplied by the departmental reps, in-plant salesmen who advise potential customers on ways photography can help them solve problems. A common case is the customer who has a small budget and a Cecil B. DeMille approach. The department representative tries to inform him of the photographic facts of life. Often, the advice may be to use black-and-white instead of color. Sometimes it may be suggestions for using material already in the film library. The representative is the first step in doing anything photographic.

The representative and the prospective customer, who may be from one of the staff departments —public relations, personnel, etc.—or from one of the manufacturing or product divisions, first discuss the customer's budget and basic ideas. The next step is a conference with Film Service where a more detailed look at the project is made.

It is during this phase that Film Service has an opportunity to show what they can do and to bid for the contract. Under company policy, any supplier, in-plant or outside, can be used. The pressure is thus placed on Ford Photographic sections to justify their existence by proving they deserve the work. The testing ground includes the most rugged of business obstacle courses, the budget. So well can in-plant sections meet customer requirements by now, that chances of Film Services getting a contract are fairly good. The budget testifies to the efficiency of the section and a row of awards on the wall of the projection room testifies to the quality attained.

Films for engineering purposes fall into three categories: analysis, time study and presentation films for management. Analysis films are made of various products and equipment to see how they work and if they can be made to work better. Films made at the test track of riding characteristics of Ford cars are typical analysis films. Time study films are made as an aid to production and management. Very often, a time study film can save many times its cost by pointing up ways to improve the production process. The final type, presentations, are perhaps the most elaborate and significant from the viewpoint of company progress. These are films which are made to show how various projects and products are doing so that the Ford Executive Committee can plan future operations. These films must be complete, concise and to the point. Top executives have too much to do to waste time on a poorly-made, rambling film which does not convey the required information for an intelligent decision.—THE END

RESEARCHER'S REPORT

Fluorescents: hard to pin down for color photography because their spectral curves run right off the page

Lamp companies often receive requests from photographers for the color temperatures of fluorescent lamps. Such requests are based on a misunderstanding, because the fact is that color temperatures cannot be used to designate fluorescent lamps for photographic purposes. Actually, some color temperature designations were used in the early days of fluorescent lighting, but the practice was discontinued because it was misleading commercial photographers. To explain why this is true, it will be necessary to go into a little theory, but this should not alarm industrial photographers, who take much more complicated matters in their stride.

Physicists deal with an imaginary object called a "black body," which is so black that it absorbs all light falling on it. If such a body is heated enough to make it glow, its color will be directly proportional to its temperature on the Kelvin scale. (Degrees Kelvin are degrees Centigrade plus 273. That is, the Kelvin scale starts at "absolute zero.")

Although there is no such thing as a true black body, an incandescent lamp filament is close to a black body in behavior so that for many practical purposes, such as photography, its temperature may be taken as a description of its color.

It must be emphasized that such a description is entirely from a visual standpoint. If we were to say that a warm white fluorescent lamp has a color temperature of 3000K, we would mean that it appears to the "average human eye" to be the same color as an incandescent lamp having a color temperature of 3000K. This does not mean that it would "appear" the same to a piece of color film.

Fig. 1 Response curve of human eye

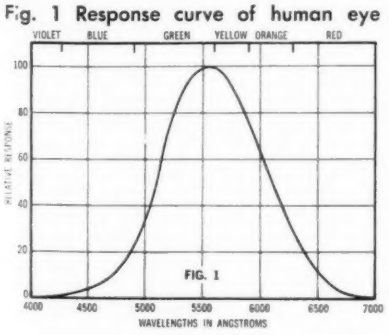
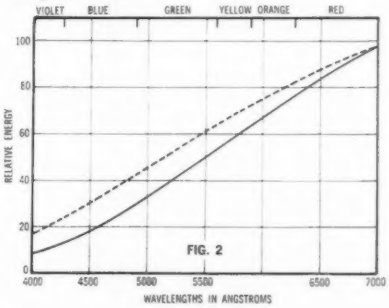


Figure 1 shows the response of the average human eye to light of different colors, that is, to different wavelengths. The eye is most sensitive to yellow-green light having a wavelength of 5550 angstroms and less sensitive to colors "warmer" and "cooler" than this. To the left of about 4000 on the chart is the ultraviolet region and to the right of about 7000 is the infra-red region. The normal human eye does not respond appreciably to radiation in either region.

The output of a light source can be indicated on the same scale by plotting energy at each wavelength

Fig. 2 SED curves of 500-watt incandescent lamps: Standard incandescent lamp (2960K _____) No. 2 photoflood lamp (3400K _ _ _ _ _)

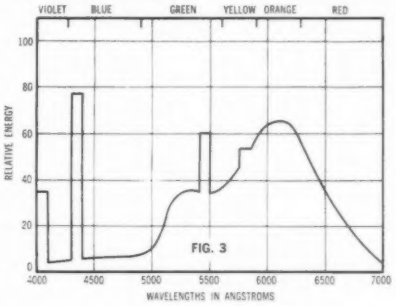


against that wavelength. Figure 2 gives a "spectral energy distribution curve," SED curve, for short, for a 500-watt incandescent lamp. Such a lamp, operated at normal voltage, has a color temperature of 2960K, but it would have a higher color temperature at higher than rated voltage. In fact, a photoflood lamp is equivalent to a normal lamp operated over voltage to produce more light during a much shorter life.

Figure 2 also includes the SED curve for a No. 2 photoflood lamp at a color temperature of 3400K. In order to compare the slopes of the two curves, they have been arbitrarily drawn to equal relative energy at 7000 angstroms. This makes it clear that the blue component increases more than the red component for a higher color temperature. The similarity between curves for incandescent lamps operating at different color temperatures explains why it is easy to correct for a difference in color temperature by using a simple color filter.

Now let us look at the SED curve

Fig. 3 SED curve, Deluxe warm white fluorescent lamp



for a deluxe warm white fluorescent lamp shown in Figure 3. This is the fluorescent lamp which is closest to an incandescent lamp both in appearance of the lamp and appearance of lighted objects. Note that the curve for the fluorescent lamp combines a smooth curve with blocks of greater energy at certain points along the curve. These represent "mercury lines," where light from the mercury arc inside the lamp comes through the fluorescent phosphor. The smooth part of the curve represents the light from the phosphor. It is conventional practice to represent the energy from mercury lines in blocks, in this case 100 angstroms wide. The actual bands are very narrow and if drawn to scale in height would run off the page.

If the deluxe warm white fluorescent lamp were given a color temperature rating it would be 3000K, meaning that the lighted lamp looks to the average human eye like an incandescent lamp having a color temperature of 3000K. However, note the difference in shape between the curves in Figures 2 and 3, and remember that these are being

(*continued on page* 78)

THE FILM REPORT

The quickest and easiest way to brief the boss on what he's getting for his money is to show a movie, such as these film reports made by defense contractors for Uncle Sam

Echo I satellite is hand folded on long table

End piece gets finishing touches prior to capping

The atmosphere was tense in the blockhouse at Cape Canaveral in the early dawn of August 12. Tucked snugly into a relatively tiny sphere atop the nose cone of a Thor-Delta space vehicle was a folded mass of aluminized plastic. The countdown came to an end. As motion picture cameras angled steadily skyward, the silvery space vehicle lifted slowly from the pad and nosed toward the upper atmosphere.

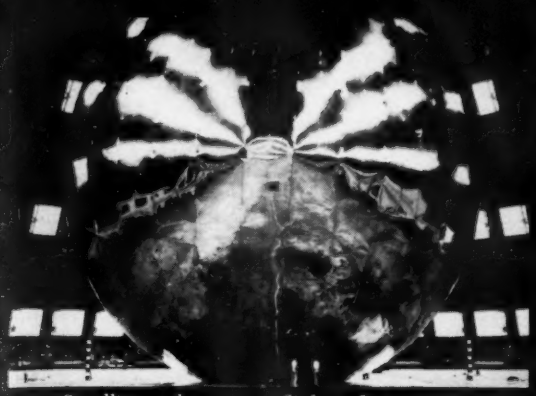
Twenty-three minutes later the sphere attached to the third-stage Altair rocket popped apart, the fabric blossomed out and assumed the shape of a gigantic, ten-story-high balloon. As it inflated with chemical fumes it began the first of an eventful series of swings around the globe. On the first pass over the United States, man would send for the very first time an FM radio signal from Goldstone Lake, Calif. to Holmdel, New Jersey, using the highly reflective satellite for an electronic, space-age bounce.

Thus was borne "Echo I." With her birth came the end of one of the most thoroughly documented projects in the history of photography. Motion pictures recorded her fabrication, witnessed her installation atop a cylindrical chariot filled with high explosives, tracked her steady ascension in the wee hours of a Florida morning until her fiery tail was simply another blot in the starry sky.

A scant three days later a fully-edited documentary motion picture capsuling the entire Echo achievement was in the briefcase of a Douglas Aircraft Co. executive flying toward a rendezvous with the U. S. space agency in Washington.

Motion pictures had helped spawn the development of both of the missiles which lifted Echo I to orbit. The Douglas-produced Air Force Thor is one of the most trusted—and photographed—of all the space boosters. But Delta, another member of the Douglas stable, was making its first successful space flight.

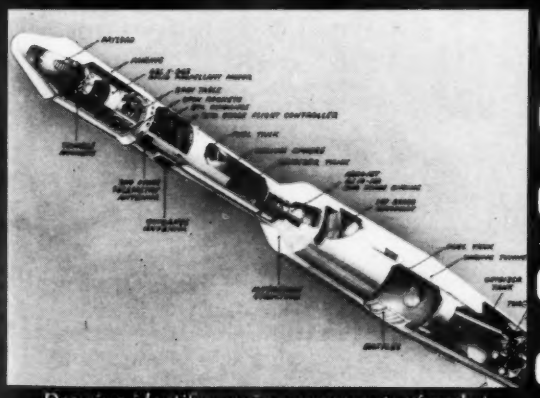
Without the motion picture, this Thor might today be far from famous. In fact, it may never have flown successfully without technical movies which have followed every firing. Failures, captured on film, have been studied and re-studied in the relative calm of the projection room. Staffs of engineers, viewing the frame-by-frame progress of an abortive mission, have been able drastically to shorten the R&D phase of a missile's evolution. In the words of



Satellite undergoes preflight inflation tests

Technicians take sights to zero in antenna

Cameramen film preparations for signal bounce



Drawing identifies major components of rocket

some technical producers, motion pictures have saved the U. S. government millions of dollars in the race for space.

The philosophy behind that statement is best described by the slight, soft-spoken chief of the presentation division at Air Research and Development Command headquarters. Major J. C. Stokes is about as "un-Hollywood" as they come. Indeed, so is his mission. Yet the technical motion picture effort under ARDC's direction may vitally support in the space of ten minutes an expenditure greater than that amassed for a raft of Hollywood productions.

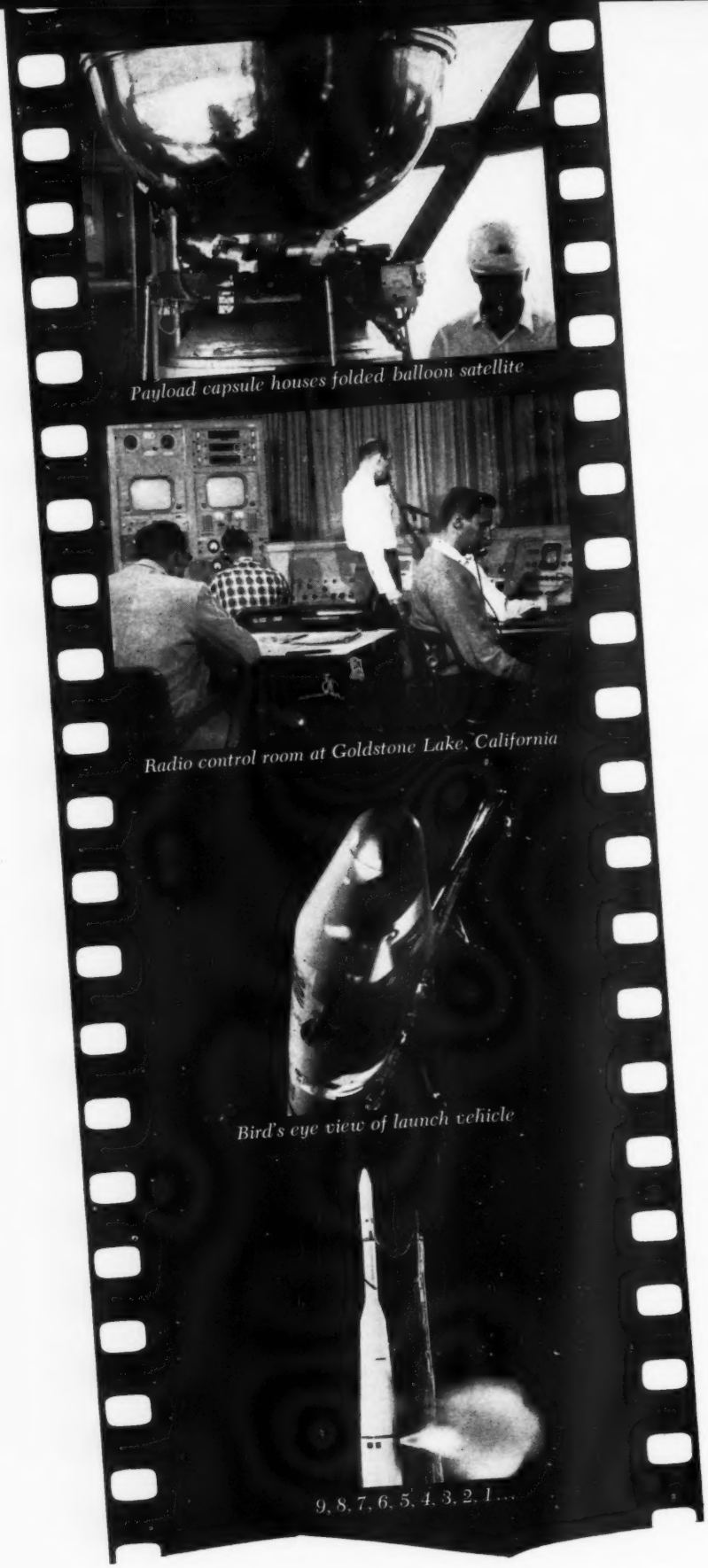
Missiles, Major Stokes points out, are not cheap. The Air Force may spend a million dollars just on missile development, to say nothing of the cost of countless manhours required to ready it on the pad, launch it into trajectory or orbit and assess the effort in the weeks that follow.

Major Stokes is ARDC's expert in "presentation management" and not an authority on photography per se. This means that his aim is ever toward a better means of condensing unwieldy masses of technical data, understood only by engineers, into concise ten or fifteen-minute surveys instantly meaningful to officers in charge.

"Officer in charge" does not necessarily infer military. The most influential "officer in charge" is the President who, despite a life-long career in uniform, is a civilian. His entourage of advisers who amass the wealth of information that makes possible his decisions, are primarily civilians, largely untrained in the technical minutiae of space aeronautics. It is up to men like Major Stokes to see that such persons are kept up to the minute on space achievements. They do this, in greater and greater degree, via the 10 to 15-min. motion picture. It is screened at briefings or executive staff meetings.

Thus have arisen two interlocking demands for the motion picture, neither of which existed to any significant degree prior to World War II. First, films become engineering mainstays, continuous and repetitive chronicles on projects such as the successful design of missiles. Missiles, once launched, cannot be called back. If one aborts, it's impossible exactly to re-create the abortive action in the laboratory.

But with motion picture cameras crammed in close, much closer than man could ever get, a permanent record of the missile's action is retained



Payload capsule houses folded balloon satellite

Radio control room at Goldstone Lake, California

Bird's eye view of launch vehicle

9, 8, 7, 6, 5, 4, 3, 2, 1...

for engineering evaluation and re-evaluation in later weeks. If the launch is successful, the films can be screened, noted and filed. It is mainly when the launch goes haywire that the photographic record becomes indispensable.

Use number two is equally fundamental to a nation's success in space. For this is the use of motion pictures to inform and, in a sense, "educate" those who are in a position to affect, directly or otherwise, the space effort. Not only the administration, military leaders and congressional whips, but John Q. Public himself feels the impact of the missile film.

Television stations probably attract more viewers of missile films than any other media. Since it is considered essential, in our form of government, for the public to be kept informed on how his money is spent, government film libraries are open to any news agency which requests non-classified films for public showing.

Everyone's making movies

Where does this raft of technical films come from? The USAF is just one source, although it is a large one. A considerable sum is annually spent by the Air Force on various uses of photography, yet the Air Research and Development Command, which administers much of the space effort, utilizes photography as a modern tool more than all the rest of the air service combined.

The Air Force's film library at Wright Field in Dayton, Ohio is stocked with millions of feet of film on a wide variety of subjects, and its stockpile is growing daily.

But the Air Force is only one user. The National Aeronautics and Space Administration, the government's civilian space agency, uses a vast quantity of film as it coordinates the space activities of the nation. NASA's film library presently is administered by Byron Film Laboratories in Washington, D. C. But as the agency expands, it is likely that it soon will have its own film library as well as staff for administration. Top film man at NASA is Byron Morgan who, with William Gratrix and Walt Herring, administers a staff of 150 scattered across the nation.

Both the USAF and NASA have their own photographers. But probably the lion's share of films relating to space comes from industry, from a handful of companies. Douglas Aircraft, in Santa Monica, Calif.; Lockheed Missiles and Space Division, in Sunnyvale; North American, at sev-

eral localities in southern California; Convair, in San Diego; and Boeing Airplane Co., far to the north in Renton, Washington supply more films than all other manufacturers combined. The reason is obvious. They make more missiles than other manufacturers.

Douglas' film chief is Robert S. Scott, Film Services Administrator. He heads a staff of 38 production people who work in a former store in the densely-crowded Los Angeles suburb of Santa Monica. Douglas does not have a sound stage, but rents one of several which are available in nearby Hollywood. Most of Douglas' films, however, are shot on location, many at Cape Canaveral.

The scope of Douglas' activity covers contractual films for the government on missile progress (primarily NASA or USAF) as well as public relations films (the DC8 is a prime contender for commercial transport business) and engineering reports. Scott points out that although engineering reports are only about 5 per cent of his total operation, they are often more significant than any other facet. The dollar savings laid to the availability of films of unsuccessful missile launchings are truly impressive, he reports.

Quick-look technique

Douglas uses 16mm Mitchells, Arriflexes and Auricons for most work. "We are", Scott says, "known for our use of the Auricon for single-system 'quick-look' reports on current projects. On a launch, for example, we will photograph in detail, edit, soundtrack and reproduce half-a-dozen copies within 24 hours. Our engineers can survey the results of several months' work at their leisure the very day after an operation takes place."

The sound is all recorded optically on such projects, primarily because it fills the bill for speed, efficiency and suitability. "Quick-look" prints do not require wide duplication, and the noise-free advantages of magnetic sound are not required.

Douglas' film unit does not handle all operations. If a job can be done quicker or better elsewhere, it's subcontracted. Animation, for example, is all done under contract. The Douglas unit has no facilities for this type of work. If the volume increases, perhaps an animation department would be added. But not, says Scott, for the present.

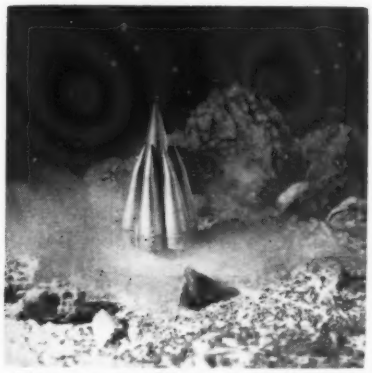
Scott is most proud of his unit's

(*continued on page* 93)

Film Activities in the Armed Forces and NASA

Air Force film reports . . . made under specs found in Table 210 . . . final decision on type of film used made by Weapons System Project Officer (WSPO) for each project . . . he decides type, number and length of film . . . Table 210 is change from former AF contracts which merely specified that "each supplier will provide periodic motion picture reports" . . . for info on AF films, contact Rod Radford, Headquarters, USAF (AFOOP-SV-MP), Washington 25, D. C. Copies of Table 210 available from Lt. Col. Hatlem, Hq ARDC, Andrews AFB, Washington 25, D. C. AF estimates 1959 film footage at 22,000,000 . . . people involved in film activities, about 1,100 . . . Navy film reports . . . supervised by Tom Cassidy, Bureau of Naval Weapons (FFPH), Navy Department, Washington 25, D. C. Use of films in Navy just beginning compared to amount used in other services and government agencies . . . no estimates of footage now available . . . Army film reports . . . no standard clauses . . . vary from contract to contract . . . information on Army films available from Office of the Chief Signal Officer, Army Pictorial Division, Motion Picture Branch, Pentagon, Washington 25, D. C. Films stored at Army Pictorial Center, Long Island City, N. Y. Army estimates footage used in the "millions" . . . film without permanent value destroyed, not kept . . . NASA . . . agency too young for extensive library . . . film stored at Byron Film Labs, 1226 Wisconsin Avenue, NW, Washington 7, D. C. until agency gets depository of its own . . . about 150 people engaged in film making at regional offices . . . no footage figures available . . .

Model of Delta-Echo vehicle in space, used in film on the Echo I satellite.



This is a possible nuclear-powered interplanetary space rocket.

Movie crew (l to r): R. D. Schwartz, R. Goodwin and W. Gobson.

Recording session for "Admiral Dan's Pandemoniacs" produced at Douglas.

WHAT'S WRONG WITH SCIENTIFIC PHOTOGRAPHY

I wish to examine the profession of scientific photography in the United States, a subject which I believe worthy of the closest scrutiny today. On the whole, five aspects of this topic cry loudest for attention. I'd like to take them up in order: 1) Education for the profession; 2) standards for the profession; 3) the literature; 4) the professional societies; 5) management attitudes affecting scientific photography.

Education

The most salient fact about photographic education in the United States is that it is seriously neglected. From the highest level to the lowest, workers in scientific aspects of photography are borrowed from other fields, or indeed, other countries. For example, any list of the more outstanding photographic scientists is bound to include a predominance of men trained in Europe. Mees, Clark, Courtney-Pratt, Duerr, Eichler, Hamer, Brooker, Crabtree—to name a few—took their training abroad, where photographic education culminates in the doctorate.

Nothing approaching European photographic training prevails here. The bulk of our homegrown photographic research talent therefore, must, be recruited from persons trained as physicists, chemists, engineers (or musicians). Obviously these persons have been productive, but it is also obvious that much of the training must be beside the point and that the terminal education must take place in the few American firms actively engaged in photographic research. This means that high-level training for the *application* of photographic knowledge to scientific problems outside the production of photographic goods and equipment is most seriously lacking. It's an unsettling fact that the comparative handful of graduates from the only four-year college program in photographic technology is for the most part absorbed by the photographic industry.

Thus the vast majority of men who follow the profession now called "photographic engineering" are advanced photographic technicians who acquired their working knowledge in the school of hard knocks. This is no discredit to them, in fact it is a salute to their determination, but it is a reflection on a nation which prides itself in its technological advances—almost all of which are dependent in some way on scientific photography.

What education is available for our most advanced practitioners of scientific photography consists of short courses, seminars and extension courses. Typical are those offered by the University of Southern California, University of Wisconsin, the University of Iowa, the University of California at Los Angeles, the Rochester Institute of Technology and the Massachusetts Institute of Technology. They are necessary; they are just about all we have. But they are a far cry from the educational program we have learned to respect in the preparation of a professional man.

PHOTOGRAPHIC RESEARCHER, CAMERA DESIGNER, HIGH-SPEED PHOTO EXPERT JOHN WADDELL, FRPS, FEELS WE HAVE A LONG WAY TO GO

This matter of education has another aspect. A practical knowledge of photography is a requirement in many technical fields. Metallurgy and astronomy are perhaps good examples. But as a rule any indoctrination students in these fields receive in photography is strictly informal. They must learn either by osmotic pressure or teach themselves. Even more glaring is the omission of photographic training in other branches of natural science and technology. For example, I consider the high-speed camera to be a basic tool of mechanical engineering today. I have never heard a doubt expressed in this matter. Now it is not terribly difficult to learn to use a high-speed camera. I have taught a 13-year-old boy to use one, and it did not take long. Yet many graduate engineers still feel that high-speed photography is full of optical illusions, a black art as comprehensible as witchcraft.

It is appalling for me to see the engineering manpower that is wasted for failure to use time-lapse, or still, or motion picture photography for studies of corrosion, shock, vibration, flame and other phenomena where the photographic technology is well developed and where it should be well known.

I think attention needs to be paid to these matters. I think American science deserves, perhaps in spite of its own attitudes on the subject, men who are educated at a high level in the application of the science of photography to the many branches of knowledge to which photography has so much to contribute. I think, furthermore, that the training of our natural scientists and engineers should include an introduction to the principles of photography and instruction in the use of photography as a tool in their own area. Many of our otherwise advanced institutions are just awakening to these needs now, but for the most part we must start from rock bottom.

Standards

The problem of standards creeps in throughout the application of photography to scientific investigation.

It begins with personnel. Practically speaking, there are no professional standards in scientific and engineering photography. There are no common educational qualifications because, as discussed previously, there is very little education. Experience is difficult to judge because it is so varying. Job titles mean almost nothing because there are so many and they all overlap to some degree.

This is bad for the profession, because it casts doubt on whether it is a profession at all.

It is bad for the employee because there is no bench mark against which to judge himself, and no firm basis for talking turkey. He has to depend on luck and salesmanship alone.

It is bad for the employer because he must dig deep to turn up a man suited for his job. Being that this is such a relatively small field and represents so small a portion of the total labor force, he cannot afford to do too much digging.

It is bad for the beginner with capabilities in the field, because the situation is so confused he cannot know where to turn.

Some voices are to be heard on this matter, but they will have to be louder and they must be accompanied by decisive action before anything can be accomplished.

While this may be the most crucial area for the application of standards, there are many other knots seemingly just as difficult to untie.

Efforts to standardize on a mount for rotating prism camera lenses seem to be progressing at about the same rate as the solution for world peace.

The 70mm perforation of film presents another sticky subject. Two types of perforation exist. Type A with a pitch of .234 in. and Type B with an .1870 in. pitch. The camera manufacturers are at sea in trying to decide which to use.

While "resolution" should be as unequivocal as centigrade temperature there seem to be as many meanings for the term as for "happiness." In fact there is a recognized need for a glossary of the entire photographic language.

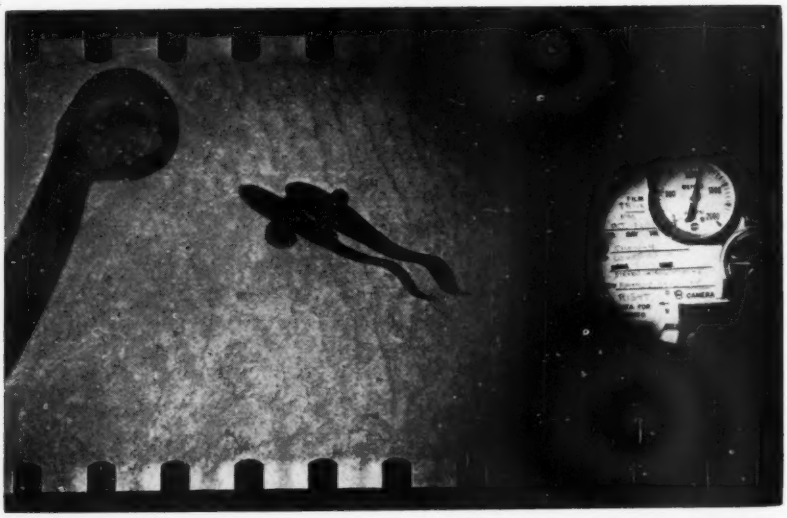
Literature

The literature of scientific photography is a real problem for the advanced worker. There are probably only two places in the United States where a reasonably complete collection of the "classics" of high-speed photographic books and papers exist. One is at the Kodak Research Laboratories and the other is privately owned.

Many of the volumes of *High-Speed Photography* are out of print. Others are virtually unobtainable. The proceedings of the Paris Conference are unobtainable. To the best of my knowledge and belief 2,500 copies of a basic text in the field gather dust in a Chicago warehouse, while queries and orders for them go unanswered. Papers which should filter through a single or a few sources appear in widely dispersed technical journals, many of which do not reach the primary audience. One would have to subscribe to upwards of 25 periodicals to keep up with the art.

Taking arms against this sea of troubles are two individuals who truly deserve commendation for their effort and diligence in coordinating bibliographies and collected (*continued on page* 64)

THE NEWEST



FRONTIER

Photography's newest frontier lies at the bottom of the ocean, hidden by miles of water. A mystery to man ever since the days of the ancient sea serpents, it is giving up its secrets to specially-designed cameras. Using automatic operation and electronic flash, these cameras are beginning to probe into the amazing life of the ocean bottom. Harold Edgerton of M.I.T. whose pre-war pioneering made possible much of today's electronic flash, is still pioneering. This time, his work takes the form of special equipment combining camera and flash which can operate under 17,000 pounds of pressure per square foot. Here is a first-hand report by Dr. Edgerton on his work helping to develop what may become our most important resource

Probably the newest, and certainly one of the most exciting, frontiers in photography today lies at the bottom of the sea, the ocean floor. Covering an estimated 150,000,000 square miles, 2/3 of which is over 1000 feet down, the ocean floor is largely unknown. An estimated 100,000 photographs have been made of this region so far, yet they cover less than one square mile of the 100,000,000 square mile area. This is comparable to an astronomer who could only sit in one spot and observe the sky through a pinhole.

Oceanographers have used sounding devices to get a rough idea of the terrain on the ocean bottom. Dredging is used to collect geological and biological samples to get some idea of the environment at the bottom. Photography, however, can show the bottom as it really is, with its mysterious tracks, ripples, currents, hills and valleys, the animal and plant life, all inaccessible by any other method.

The first major problem faced by the underwater photographer is making the equipment capable of withstanding the pressure found at the ocean bottom. This pressure increases one atmosphere (15 pounds per square inch) for every 32 feet of depth. At one mile, the pressure is 2500 p.s.i. while at six miles, the deepest known ocean depth, this pressure is about 17,000 p.s.i. We use two types of camera cases, one for depths up to one mile and one for depths to six miles. The former is a cylinder with 7/32-in. steel walls; the latter has tempered Timken steel walls ¾-in. The cylindrical shape was adopted because it made possible the most efficient utilization of interior spaces. A sphere would equalize pressure and allow a thinner wall to be used, but would present problems of efficient space utilization.

Several types of cameras offer advantages but the camera we use is a 35mm camera using 100-ft. rolls. These cameras, capable of making 800 exposures per roll, have automatic cycling mechanisms and synchronized electronic flash units.

This choice is essentially a compromise. Motion picture cameras provide continuous coverage of the ocean bottom but they require a great quantity of film, much more light and more complex mechanisms. Still cameras using larger-size film give better image quality but don't have continuous coverage. The ideal solution, a television cam-

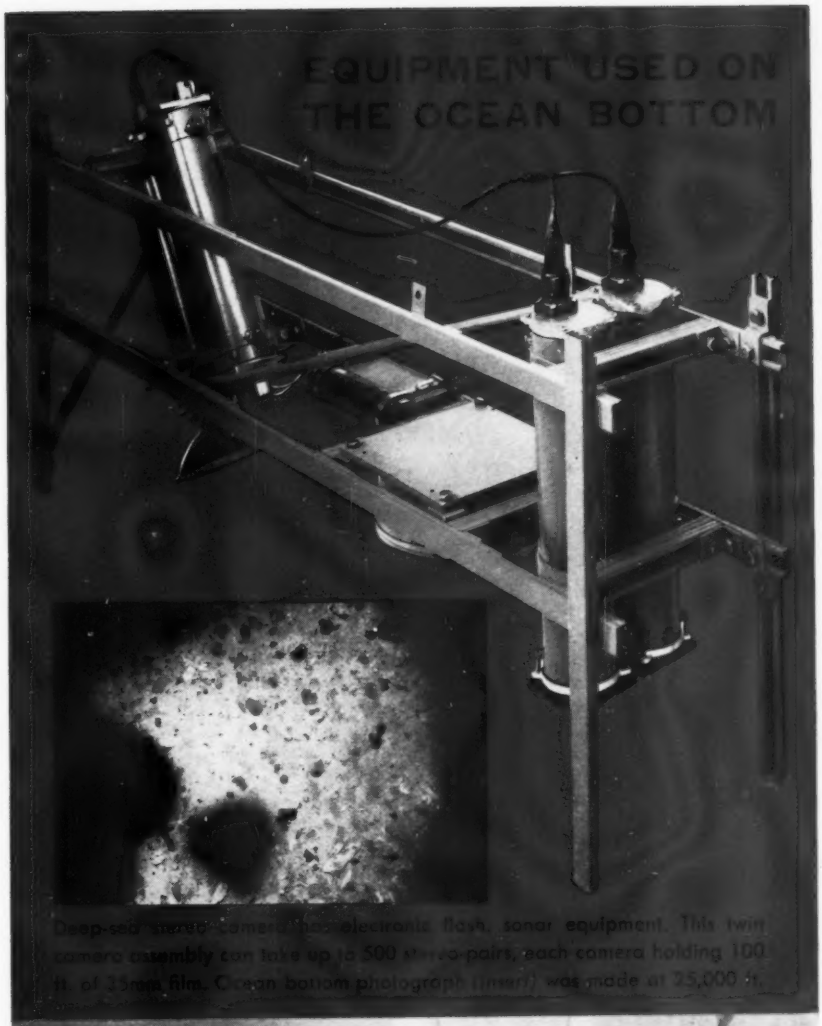
era, is impractical because of the tremendous weight of the cables needed, the lower resolution and the electrical and mechanical problems involved with cables of more than 1000 feet. The 35mm automatic cycling camera provides an intermediate degree of continuous coverage. Because the camera is capable of taking many photographs, the probability is that some of the frames will record data of value despite the fact that the cameras are operated blindly. This reasoning applies both to still and to motion picture cameras.

One type of camera developed for this use is the EG & G Type CA-8 camera. It accepts a standard 100-foot roll of 35mm film. A capacitor pulse circuit operates the Wollensak "O" shutter. The shutter, a special type, is used at depths less than 600 feet to eliminate blurring caused by ambient light when using electronic flash as the actinic light source. Deeper than 600 feet, the shutter is unnecessary because of the lack of ambient light.

With each picture, the camera also photographs an internal record data chamber on the same frame. This chamber holds a depth gauge, a clock, a data card and other instruments which may be required. A battery-driven six-volt motor light source pressure casing transports the film. Among the optics available for underwater use is a special 35mm f/11 three-element lens, designed by Professor Robert Hopkins of the Optics Department, University of Rochester, to correct for optical errors caused by the water-glass interface in front of the lens.

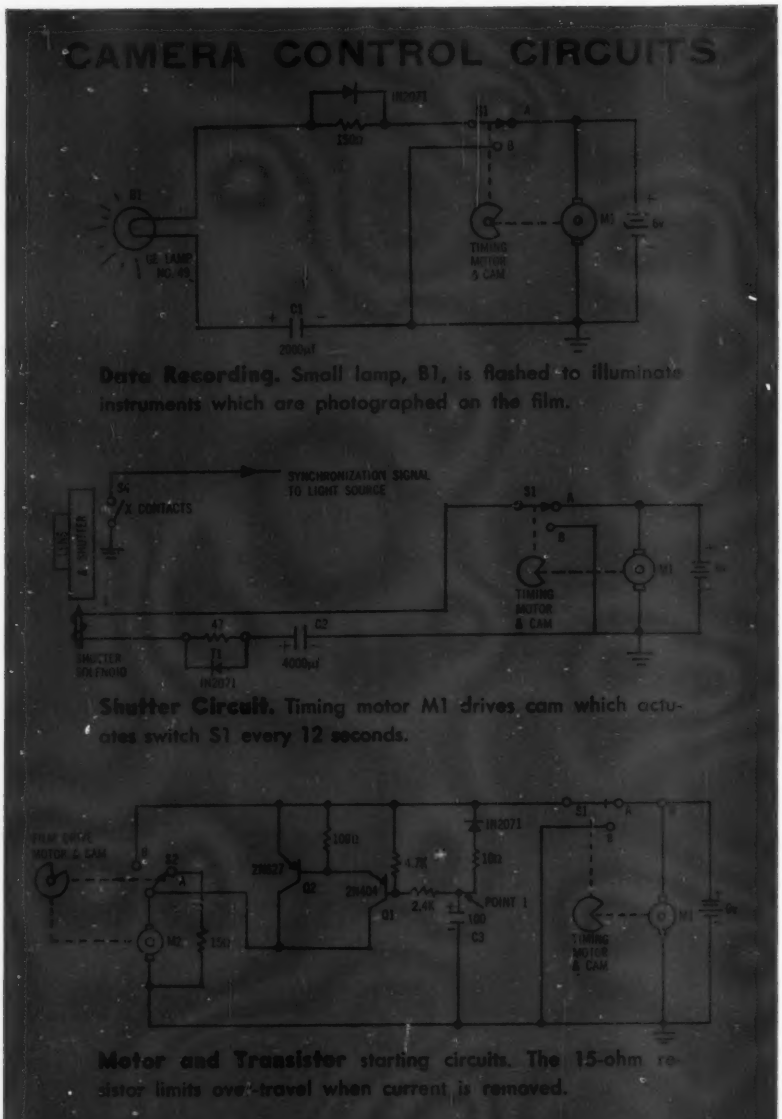
The camera can be wired so that the moment of camera exposure can be controlled by a hand-operated button (as in the bathyscaphe, an underwater chamber carrying observers to the ocean bottom) a cam-operated timer motor or a "bottom" switch. Called "pogo-stick" photography, this method uses a switch suspended below the camera. When the switch touches bottom, the camera is activated. The length of line from which the switch is suspended is accurately measured so that the camera will be in exact focus when the switch touches bottom.

The second major problem, illumination, is solved by the use of electronic flash. The short duration of the flash ensures sharp pictures even though the camera may be moving over the bottom at consid-



Deep-sea stereo camera has electronic flash, sonar equipment. This twin camera assembly can take up to 500 stereo-pairs, each camera holding 100 ft. of 35mm film. Ocean bottom photograph (inset) was made at 25,000 ft.

Interior of camera. Reels of film are in tandem so that case will be as small as possible. Dial is also photographed.



Data Recording. Small lamp, B1, is flashed to illuminate instruments which are photographed on the film.

Shutter Circuit. Timing motor M1 drives cam which actuates switch S1 every 12 seconds.

Motor and Transistor starting circuits. The 15-ohm resistor limits over-travel when current is removed.

Converter circuit. This charges the capacitors in the electronic flash light source to 900 volts from the six volt battery.

erable speed. The flash units will operate for several hundred flashes before the batteries need recharging. A time delay switch is used in series with the battery to delay the start of the operating cycle until the camera reaches the desired depth. This timer can be preset to delay operation up to two hours. Once the time delay switch activates the camera, the unit begins to operate automatically for two hours, until the film supply is exhausted.

The ability to operate from batteries is a major advantage of electronic flash. This eliminates the need for wires and lines from shipboard power supply. The battery used should furnish the heavy, transient currents required by the charging circuits, plus having high energy storage per unit volume due to space limitations. One type of battery which meets these requirements is the 6-volt Yardney silver-zinc battery (four cells, type LR-21), a wet, rechargeable unit with 20-ampere hour capacity.

Operating assemblies consist of a camera and light source housed in two separate pressure-resistant cylindrical steel containers connected by an electric cable. A variation of this is the EG & G Underwater Camera System, two cameras operating together to produce stereo photographs. In addition to the cameras and flash tube, a battery-operated sonar "pinger," producing a 12-kilocycle pulse every second provides the winch operator with a continuous indication of camera-to-bottom distance. Thus, it is possible to suspend the camera at the correct distance from the bottom for sharpest focus. Some underwater photographers, such as Jacques Cousteau, mount the camera on an underwater sled, dragging it along the bottom from the ship.

The cameras are usually loaded with the fastest film consistent with fine grain. For black and white, Plus-X Pan, with an exposure index of 200, is often used. For color work, High Speed Ektachrome is used at an index of 160.

Present cameras can photograph an area of bottom only about 50 square feet, due to the comparatively low output of the flash units and the high light absorption of the water. More powerful lights should make possible pictures at a greater distance from the bottom. If it were possible to photograph from 100 feet off the bottom, the area covered would be 100 feet square.

MEMO ON:

PHOTO MANAGERS HEADACHES

Most of them are caused by management, money and manpower

The woes of most photo chiefs can be described as the three M's: management, money and manpower. Apart from a few scattered comments on the shortcomings of equipment designers and the dilatory deliveries of supply houses, complaints in these three areas are responsible for most of the headache remedies consumed by the men who head in-plant sections.

As with one voice, photo chiefs complain that management shows very little understanding or appreciation of photography. This lack shows up in various ways. A basic complaint is that managements tend to think of photo sections as tax-deductible luxuries rather than as integral parts of the plant set-up. In some cases, notably non-defense or non-research sections, needed equipment is not ordered nor extra people added to meet increased work loads. A common attitude found in management people, many of whom are amateur photographers, is that photography is easy and requires only a modicum of skill. If they had the time and the equipment used by the in-plant section, they could turn out just as good pictures. Since they don't have the time, the work is given to photographers. The result of this attitude is reflected in the low salary scales found in many in-plant sections, often only slightly higher than assembly-line workers.

Personal work, both on company and private business, is another headache from management. Many times, engineers will take pictures paying only vague attention to proper exposure or composition. These films find their way into the photo lab with instructions to develop and print in a hurry. The negative quality is often so poor that much time and effort is wasted trying to get a decent print. If a print finally is coaxed from the miserable negative, deficiencies are blamed on the photo section.

Requests for personal work are always troublesome, becoming more so as the rank of the pest increases. Very often, the only answer is to enforce company rules that every job must have a job-order, signed and approved. One photo manager told people that he would be glad to handle it, but that the lab was so busy they were sending out company work for processing. He would be glad to send their film along and give them a bill. A less common complaint was people who 'borrow' supplies, perhaps on the basis of past favors. Here too, strict inventory control and accountability procedures cut this nuisance down from a flood to a trickle.

No management appreciation

The lack of appreciation by management for photography finds its most tangible expression in the budget, especially that part devoted to photographic salaries. There is universal agreement that with few exceptions, salaries are too low either to attract or to hold top-quality people. This is especially true in the case of darkroom technicians. In most cases, they are rated below photographers so that no matter how good a man may be in the darkroom, he cannot advance past a certain salary level without getting a camera thrust into his hands. If, as reported in several cases, he is a lab wizard but a camera dud, this promotion may cost the company a good inside man for a poor outside one.

A problem is the lack of uniform job classifications, standards and wage rates in the photographic field. Quite often, the only way a man can get a raise is to "job hop," going from one job to another with a small raise at every step. One section chief commented that if a man comes in claiming to be a darkroom technician, there is no way of knowing whether he was a first-class printer or the kid who fed the rotary dryer. This same section chief felt that was unfair for a man to be able to get more money merely because he leaves his present job to get a new one. He felt that it penalized the steady, reliable worker who sticks with a job. Also, he felt that similar jobs should pay just about the same for an equal level of competence. As things are now, a photographer in a hospital or in civil service will not get as much as his brother-photographer in aircraft or missile work.

Apart from the manpower troubles caused by inadequate salaries, the lack of training gave many photo managers a fair amount of grey hair. Few managers feel that photo schools provide adequate preparation. They felt that the few that were good were only good in one area, either theory or practice. It takes both to be a good photographer. Many would-be photographers don't have the patience or inclination to learn the craft of photography. Somehow they feel all they need to be a photographer is a 35mm camera and a beard.

Only a few section chiefs complained of management overloading their departments. Most cases of overloading are a result of unusual conditions, or of peak work was the reverse: management did not give the photo department enough to do. To many photo managers, this is another aspect of management's lack of information or appreciation of the place photography occupies in industry. A few suggestions for management briefings

(*continued on page* 82)

DOUGLAS AIRCRAFT COMPANY

Perhaps the most important and useful medium of communication between Douglas and its customers is the motion picture. Here is an analysis of the group which gives this jet-age a loud, clear voice—by Ernest Reshovsky

When it comes to being appreciated and recognized within the company, Douglas Aircraft Company's Advertising Film Services is in a top spot.

We were told by Donald Douglas Jr., President of Douglas Aircraft Company: "I am thoroughly convinced that photography in all its aspects is providing us with a vital means of communication in the missile and space age. The unprecedented responsibilities placed upon management in the high-priority field of research and development are demanding newer and more efficient techniques for creating maximum understanding in minimum time. The complex systems and advanced technologies developed in recent years have complicated the problems of management communication. The imaginative and versatile use of the film medium, integrating both technical and documentary photography, has helped us greatly to communicate more effectively, both to our military and commercial customers and the public."

We found this same attitude reflected in all echelons within Douglas Aircraft Company. The Vice-President-Engineering, E. F. Burton, called cameras "indispensable" and went on to say: "The camera can extend our human senses to explore and to record our experiences in this expanding space laboratory. The same pictures that have been exposed for strictly engineering purposes can, of course, be reproduced to serve many other management needs—and very often they do."

The Advertising Film Services group was originally organized by O. B. "Ben" Marble, Director of Advertising at DAC who first saw the need of a film group to service the management and engineers. This was in June 1953, when Walt Tufts (now Chief Cameraman) was the entire staff of the group. At present the department consists of 40 employees, including those assigned at various field stations throughout the country.

Bill Gibson, Assistant Administrator of the group, said: "Admittedly this is one of our advantages: To have an enthusiastic photographer like Ben Marble as an important representative of 'higher management.' It makes the job of selling film communication a lot easier."

The chain of command to which Gibson refers goes from Robert S. Scott, the Administrator of Advertising Film Services, directly to Marble who in turn reports directly to the president of the company, Mr. Douglas.

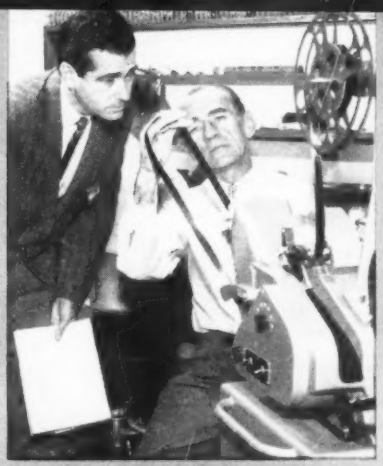
The Film Services Group is responsible for all motion picture production of the company's five major divisions: Santa Monica, Calif. (the actual home of the Film Services Group); El Segundo, Calif.; Long Beach, Calif.; Tulsa, Oklahoma and Charlotte, N. C., as well as field stations in Sacramento, Calif.; Vandenberg Air Force Base; Cape Canaveral; Kwajalein and others.

BESIDES TAKING PICTURES . . .

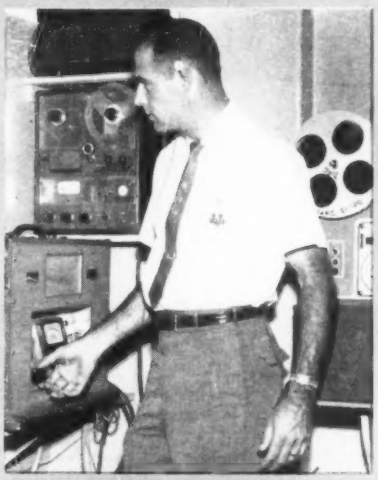
Douglas people handle all the various non-photographic chores which must be done to keep an effective, efficient section in business

A movie is not a private affair. Here at a planning conference, the first step in a film, Robert Scott, Administrator of Film Services *(seated, center)*, discusses plans with O. B. Marble *(left)*, Director of Advertising. William Gibson and Jack Gabrielson *(standing l to r)* of Film Services, observe proceedings.

Paper work, with Dave Barkell and Maxine St. Germain working out details of an Air Force-Douglas contract. Film control *(below)* keeps track of over million feet of film per year. Barbara Duncan writes up work orders while Bob LeRossignol *(extreme right)* reviews daily inputs with Sheldon Jacobs.



Editing. Selecting scenes for Douglas films are John Mahon (l), writer-director, and Gene Hasler (r), chief editor. Test footage is used in other films.



Sound recording. Bob Goodwin monitors sound during a recording session adding narration to a film. Words are almost as important as the pictures.

Film Librarian Sally Baldwin handles over 1500 requests for stock footage each year. Her inventory is constantly growing as new films are made.

DOUGLAS AIRCRAFT (*continued*)

The operation of the Film Service Group is centralized under one management, whether films are produced for TV release, sales promotion, progress reports for the military or "crash-crash" contract proposals for limited but important audiences.

This central control method avoids waste and duplication and more than offsets the cost of shipping units, equipment, etc. all over the country.

If one of DAC's five divisions needs a motion picture a written request is sent directly to the Advertising Department in Santa Monica, Calif., where it is evaluated as to need, priority and purpose. The embryonic project is then passed on to Film Services where a writer-director is assigned by the executive producer of the group. A production number is given and a production breakdown as to location, personnel assignments, cost and target date is made. At all times throughout the production the initial budget is carefully watched.

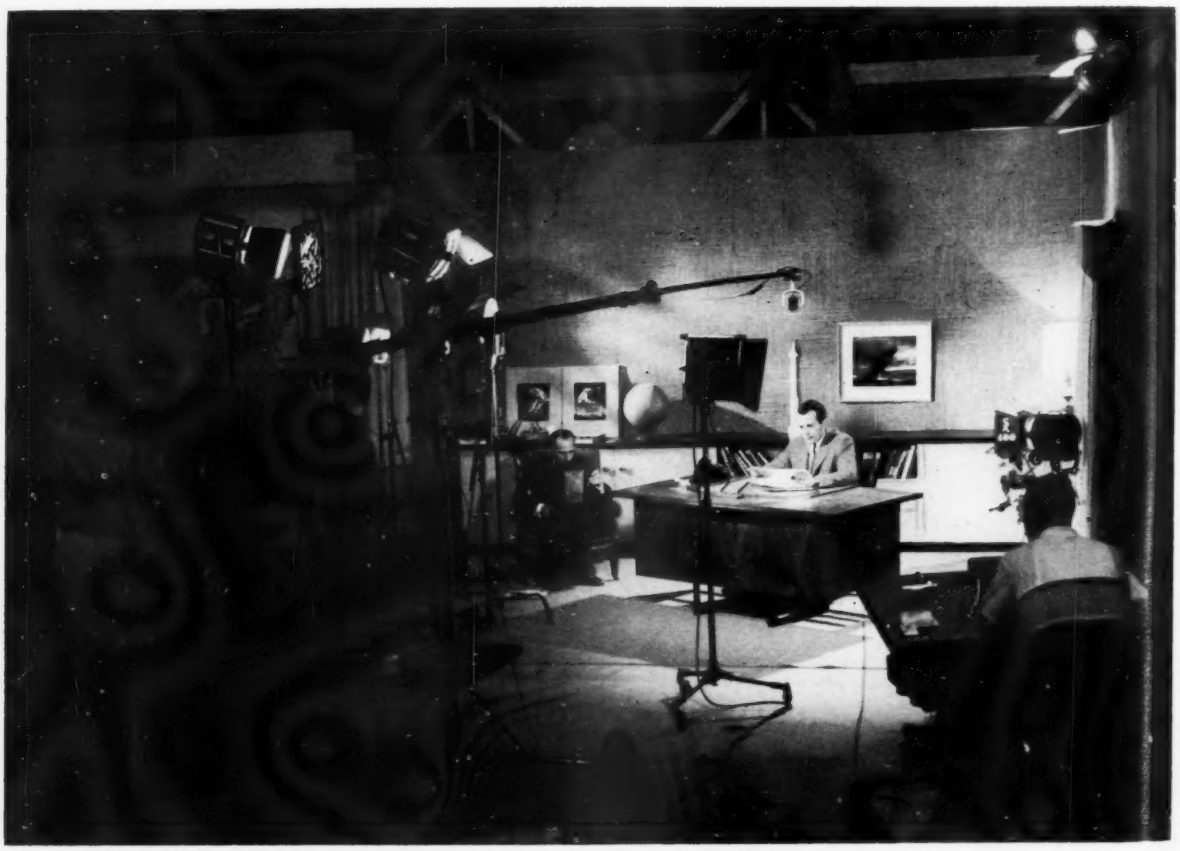
During the last twelve months 44 major films were completed, with a large number translated into Spanish, Portuguese, French, German and Japanese, the languages of many customers.

In addition to these productions, there are films which are a formal requirement of military contracts. Sixteen of these pictures were completed within the last year, over 10,000 man-hours or about one-third of the Group's total work load.

High-speed and instrumentation

Another phase of the group's work is engineering film coordination. The engineering and service groups, as well as the aircraft and missile flight test departments, are supported upon demand with high-speed and special instrumentation photography during important tests. Since engineering film support is being supplied by the group, it often happens that exciting test footage is incorporated into some of the general release films thereby greatly enhancing their visual impact.

A very successful communication tool, and a subject of pride to the Film Service Group, are sound-on-film, quick-look, engineering color film reports. These are concise 8-15 minute movies produced in the field on Auricon single-system cameras. These film reports consist of three parts: 1)



Production crew shooting briefing film on Nike Zeus featuring Douglas' president D. W. Douglas, Jr.

"pre-launch," during which the engineer in charge of a test has 3-4 minutes to describe the test objective; 2) "launch" or actual test footage and 3) "post-launch critique," at which time the test conductor or chief engineer evaluates results of the test. At this point it is often possible to employ telemetry charts showing some of the results.

The engineering film reports—also called "Film TWX's" around the Film Service Group—are photographed on 16mm single perforated Ektachrome stock, using Auricon PRO 600 and 1200 cameras with variable area or variable density soundtracks. Release prints are made on Kodachrome 5269 stock. This provides a negative track on the 5269 release print with good sound quality. Although Bill Gibson prefers the use of a camera equipped for a variable area track rather than a variable density track, a sound exposure setting of No. 17 with variable area and No. 15 with variable density tracks has proven successful under most conditions.

The film's pre-launch segment is usually photographed one or two hours prior to launch with the test conductor commenting on the time, date, the test objectives and problems encountered during the countdown. This portion is usually photographed using the missile as a background and cutting to close-ups of specific areas of the missile.

When the firing area is cleared of personnel, the cameraman retreats to a suitable tracking area and covers the launch, still using sound.

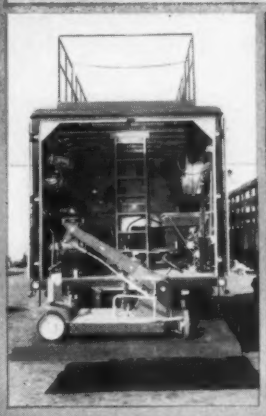
After the firing, the third segment of the film is photographed: the launch critique which usually takes place in the block house or data reduction room. Here the test conductor comments on the launch, flight and the results of the test objective, as well as any possible damage to the launch area. This information is usually supported with telemetry data available at the time.

The undeveloped film is then hand carried to Los Angeles by the film director-editor who upon arrival, follows the footage all the way through the lab, editing room and back to Douglas Aircraft Co. in Santa Monica. Project engineering screenings take place at the plant never later than 12 hours after undeveloped film reaches Los Angeles.

Bill Gibson gave us a cost breakdown as follows:

Raw stock (Ektachrome, maximum 400 ft.)	$ 24.35
Processing (maximum)	$ 20.---
Editing time of director-editor (8 hrs. @ $7.25)	$ 58.---
Titles (shot ahead of time)	$ 30.---
Answer print (13.5¢ p. ft.) (maximum)	$ 39.---
Lab overtime	$ 50.---
15 release prints	$400.---
Total	$621.35

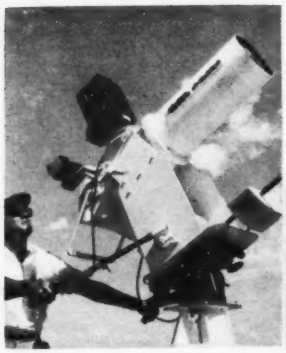
TRAVELING STUDIO



To give Film Services Group the mobility it needs to cover Douglas' far-flung activities this generator truck was designed. Shown at the top with some of the lighting equipment used, it permits location work independent of local power, lighting facilities. Electrician Earl Grabhorn *(lower right)* makes splice using working area of equipment truck *(lower left)*.

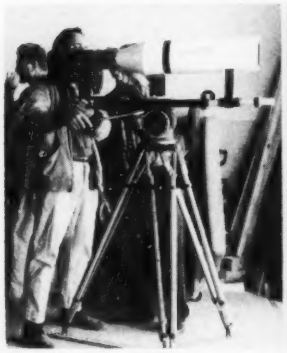
This is the truck being swallowed by an omniverous Air Force cargo plane for airlift to an overseas assignment. Film Services Group does not always use every piece of equipment on every job but the ideal was to create a self-contained mobile unit, since much of the Group's work is in the field.

DOUGLAS CAMERAMEN



Frank Roh and 100-in. lens

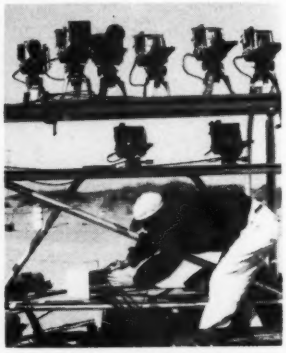
Douglas camera mount



Aligning tracking cameras

Dick Schwartz in cold room

Radio-controlled cam



Ken McVey at White Sands

Jack Johnston, Bob Timme

Bob Goodwin and Arriflex

The negative and the answer print are kept in the Douglas files. Some of the footage is often used at a later date intercut into other films.

The "Film TWX's" have been so successful that DAC is requesting the major subcontractors on the new Skybolt project (G.E., Aerojet, Nortronics) to make similar films of major component tests on their part. Cameramen-coordinators have been sent by DAC to the film departments of the various companies to demonstrate the technique of making the quick-look engineering film reports.

Usually less than 24 hours elapse between the actual shooting of the footage and the time engineers at various locations can see the completed sound color film reports. In the case of Nike-Zeus tests, prints of the completed film reports are air shipped to the Pentagon, Bell Telephone Labs, N. J., Army Missile Division, Huntsville, Alabama and to White Sands Proving Ground, where most of the tests are conducted.

In 1959 twenty-two of these quick-look engineering film reports were produced. By the end of this year the figure will have jumped to thirty.

Talking to Robert S. Scott, Administrator, Advertising Film Service, we got a pretty good insight into the philosophy underlying the groups' functions and successes. "I am convinced that the motion picture medium is uniquely capable of answering the challenge of space-age communication. My interest is focused upon the use of film as a means of communication. The film communication medium is a highly developed 'photosynthesis' in the true sense of the word. It is a creative montage of many arts and sciences—old and new—'put together with light' to produce a maximum over-all impact upon a captive audience. Words and pictures, sound effects and music—imaginative and versatile animation in any choice of colors. High-speed, microscopic, telescopic, zoom and remote—the camera's eye can go where we can't go, and see what we can't see—and live forever to tell about it in the future. This creative tapestry of dramatized information can be rolled out anywhere, anytime, for anyone. Its interwoven symbols are heard and seen like 'instant-experience.' In this way it becomes so much more than 'just a movie'. It is dynamic symbolism—a creative communication—a scientific art. To advance our art, we must develop not only movie techniques but also ourselves to become more effective film communicators.

That this type of philosophy bears fruit is shown by some of the awards earned by DAC Film Services, which include seven Chris Award Certificates from the Columbus Film Festival, one Chris Award statue, a sweepstake award from the First Annual Technical Film Festi- (contd. on page 80)

HYZER ON HIGH SPEED

If you know film, f/no., exposure time, scene area—this chart estimates the amount of lighting needed

If high-speed camera users were asked to name the specific problem that plagues them most, the answers would be predominately related to exposure and lighting. Although many significant improvements in emulsion sensitivity and light source efficiency have been made in recent years, the problem of inadequate lighting in many fields of application is still a real one. Fortunately, most industrial subjects are confined to small areas, so less lighting power is needed to bring the illumination up to the required exposure level.

Light sources in high-speed photography assume many sizes and shapes and are based on widely divergent principles of operation. Aside from sunlight, flash lamps, tungsten sources, and electronic flash—which comprise the top of the list of most commonly used sources—argon flash bombs, pyrotechnic sources, exploding bridge wires, sparks, xenon arcs, and mercury vapor lamps are also used for specific applications. They will be discussed in the months to follow.

Of the more common light sources, tungsten lamps are most widely used for indoor industrial applications. Sources of electrical power for incandescent lamps are not ordinarily portable; hence the photographer is forced to rely upon power line facilities provided within the plant. For this reason it is extremely important to be able to estimate the electrical power required to illuminate various subject areas. Almost without exception, tungsten sources are overvoltaged for high-speed motion picture work. Operating at a color temperature of 3400K, the luminous efficiency of a tungsten filament is about 34 lumens per watt of power input. It can be shown that the minimum power in watts required to illuminate a typical subject by flat, frontal illumination is:

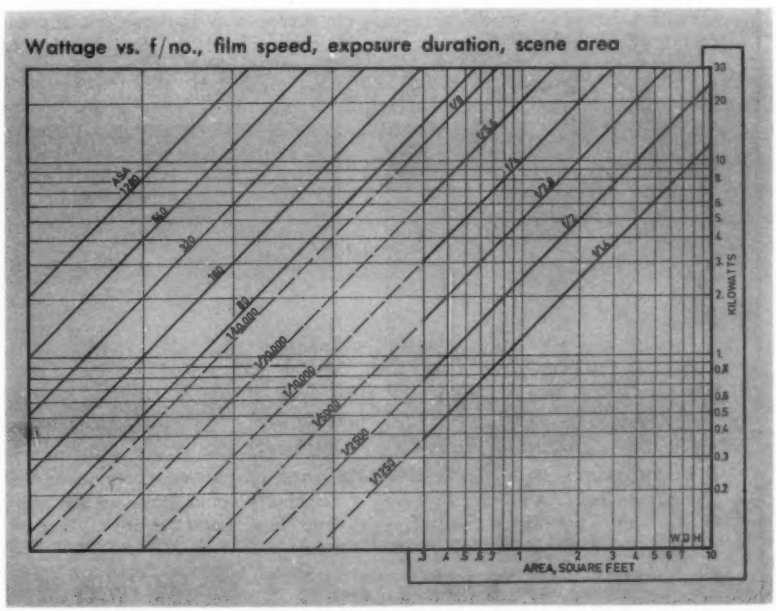
$$W = \frac{I\,A}{5\,R\,(\tan\theta)^2}$$

where: W is electrical power, watts; I is illumination, foot candles; R is reflector efficiency factor; A is area of illumination, square feet; and θ is ½ of the angular coverage of the lamp, degrees. Equation 1) is based on the efficient placing of the lamp relative to the area to be illuminated, with a minimum of spill-over into surrounding areas outside of the camera's field. As a rule of thumb, R and $(\tan\theta)^2$ in Equation 1) are inversely related, so the product of the two quantities equals a constant. That is to say, when the reflector efficiency factor (R) is increased, the area of light coverage decreases proportionately for a given lamp-to-subject distance.

The following chart is based on this approximate relationship. From the chart, the minimum power required to illuminate a given subject area may be estimated.

For example, we want to photograph a mechanical event occupying a field area of 2 sq. ft. at 1/15,000 second using film with an effective ASA speed rating of 160. Depth of field requirements limit the aperture to f/4. How much electrical power is required? To solve, a vertical line is drawn from 2 square feet on the bottom scale of the chart to the diagonal line corresponding to f/4. A horizontal line is drawn from this intercept to the 160 film speed index line. From this intercept, a vertical line is drawn to the broken curve corresponding to an exposure time of 1/15,000 second; and from here horizontally to the kilowatt scale. We find that about 3 kilowatts or 3000 watts are required to illuminate the subject. Six 500 watt or four 750 watt lamps might be used. In practice, it is advisable to have more lamps and available wattage on hand than the value suggested by the chart, to permit some flex-

(*continued on page 60*)



PMI's Monthly READERS' SHOWCASE

Constant vigilance is not only the price of liberty but the price of safety in industry. A safety engineer can't just say "be careful" and let it go at that. A constant campaign is carried out to remind people that safety is not a sometime thing but a daily battle against carelessness and apathy

An important weapon in the safety arsenal is the camera, pointing out with deadly accuracy the effects of momentary carelessness or deliberate disregard for safety regulations. The pictures here were made by cameramen for Weirton Steel, Northern Natural Gas and Kerr-McGee Oil Industries. These photos are what might happen.

Because safety campaigns are so much a part of industry, the audience becomes used to the warnings and tired of hearing the same things over and over and over. It is a challenge to the photographer involved to repeat the warnings in a new way, so as to make a jaded (and, too often, an uninterested) audience wake up to the hard facts about plant safety. We think that the pictures shown here meet this qualification. They represent good examples of the "before and after" school: some show a dangerous practice, others show the possible result.

R. L. Hansen, Northern Natural Gas, Omaha, Neb., made this shot of the effect a power lawn mower has on a shoe and the foot inside. He used a 4 x 5 Super Graphic.

Otha C. Gunion, Weirton Steel, Weirton, W. Va., shows this dapper dresser about to lose his tie. A Crown Graphic and Superpan Press were used with flash.

Gunion made this picture using a Crown Graphic and Superpan Press with two bulbs, one on camera and a slave unit. Avoiding reflection from tinplate was problem.

Droopy pants legs are neither stylish nor safe. Another shot by Gunion for the Weirton Steel *Employee's Bulletin* using a No. 5 bulb on his Crown Graphic.

Dangling sleeve catching in the machinery could leave wearer with arm and hand injuries. Gunion made this using a No. 5 bulb on his Crown Graphic, Superpan Press.

Ron Stone, Kerr-McGee, made this close-up of shattered goggles which, but for the safety glasses, might have been an eye. He used Super Hypan in a Crown Graphic.

HOW WOULD YOU HAVE LIGHTED THIS PICTURE?

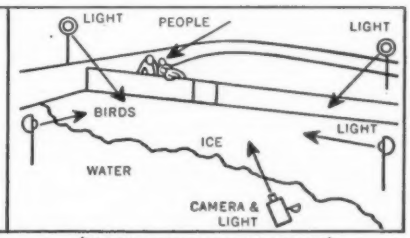
NEWS PHOTOGRAPHER DAVID FALCONER TELLS HOW GENERAL ELECTRIC #5 FLASHBULBS FROZE 47 PENGUINS!

"Forty-seven penguins had just finished a 10,000 mile trek from their icy home near the South Pole to the Peninsula Park Pool in Portland. My assignment," says David Falconer of the Portland *Oregonian*, "was to get a night picture of them in their temporary home. The only light was from a small bulb for the park attendant. Somehow I had to provide enough light for detail, yet retain the feeling the dark night gave the scene.

"I decided that reliable General Electric #5 Flashbulbs would be my best answer. By placing them in five slave units in positions surrounding the birds (see diagram below), I properly illuminated the penguins, yet kept the background very dark. A sixth G-E #5 at my camera set off the slave lights. Two of the lights actually showed in the photograph, but I took them out with retouching to increase the feeling of darkness. The exposure for the photograph was 1/50th of a second at f.8.

"G-E #5's gave the punch for a really dramatic contrast, and, once again, their dependability proved them the right bulb for a tough assignment!"

GENERAL ELECTRIC PAYS $50.00 upon acceptance of photographs illustrating difficult lighting problems you've solved with General Electric Flashbulbs. Send your picture with a detailed description to: Photo Lamp Dept., General Electric Co., Nela Park, Cleveland 12, Ohio.



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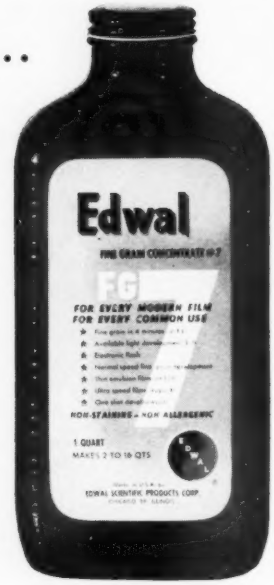

We feel a bit modest about that but we will say without fear of contradiction that:

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Edwal FG7 at 1:3 dilution *is certainly* one of the best available light developers when development is pushed to finality.

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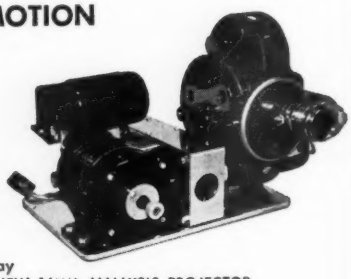

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COMING UP

(*continued from page* 10)

New York Chapter SPIE Meetings every third Thursday. Contact Don Bass, P.O. Box 177, Bethpage, L. I., N. Y. LIggett 4-8196.

New York City Chapter SMPTE Meetings first or second Wednesday of each month. Contact Ed Warnecke, Eastman Kodak Co., 342 Madison Ave., New York, N. Y. MU 7-7080.

Boston Chapter SPSE Contact John Taylor, Itek Corp., 700 Commonwealth Ave., Boston, Mass., CO 7-5210.

Binghamton Chapter SPSE Meetings every third Tuesday. Contact H. G. Morse, Ansco, Binghamton, N. Y. RA 2-4221, Ext. 573.

Midwest Industrial Photographers' Association Contact John E. Schrage, c/o Deere & Co., Photo Department, 3300 River Drive, Moline, Ill.

Rocky Mountain Industrial Photographers Meetings every fourth Monday. Contact P. H. Broadie, 2170 S. Lincoln, Denver 10, Colo. Telephone PEarl 3-2200.

Southern California Chapter SPSE Meetings the last Monday of each month. Contact Ben Augustine, 235 Annandale Rd., Pasadena 2, Calif. Telephone MU 1-0076.

Southern California Chapter Industrial Photographers Meetings every third Tuesday. Contact Janet Marshall, Executive Secretary, 5463 Virginia Ave., Los Angeles 29, Calif. HO 5-6614.

If you wish to have your meeting dates listed in this column send in the necessary information to COMING UP, PMI, 33 W. 60th St., New York 23, N. Y.

HYZER ON HIGH SPEED

(*continued from page* 57)

ibility in lighting arrangement. On the other hand, mechanical subjects painted white, for example, actually require about 1/3 as much light as indicated by the chart, which is based on a typical 20 per cent subject reflectivity. For these reasons the chart should be used only as a guide in estimating the number of lamps and electrical power required. Exact camera settings should be based on a light meter reading, preferably of the photo-electric type. Film speed index and f/no. lines may be extrapolated into the printed page to extend the range of the chart.

*Formula is derived in Mr. Hyzer's forthcoming book, *Photographic Techniques of Motion Analysis,* to be published by Macmillan Company, New York, New York.

Kodak

He knows everything about photography except how to make film.

He makes the world's best high-speed color film emulsions but tries to photograph pretty scenery through a dirty windshield.

At one of the 170 high-speed camera stations which instrument the 20,000-foot supersonic sled track at Edwards Air Force Base, Lt. Col. Earl R. Strandberg makes the acquaintance of Kodak's Walter A. Fallon. Colonel Strandberg, as chief of the Photographic Branch, has responsibility for quantitatively documenting all phenomena encountered in impact tests, static firing of rocket engines, and other activities of the Air Force Flight Test Center. Mr. Fallon, who is in charge of Kodak's color film emulsions, is visiting to observe the demands to be met by his latest products, a reversal film and its companion duplicating film. They strongly enhance information capacity through fine color distinction, sharpness, and extreme speed.

The names of the new products are **Ektachrome ER Film** and **Ektachrome Reversal Print Film.** They have a realistic quality that stimulates observers to perceive facts in super-slow-motion movies that would be lost without color.

To Walt Fallon the scenic drive through the mountains to check them out with the Colonel brought him near culmination of a hard campaign. To the Colonel, however, they represent only another step in a long history of increasing the usefulness of photography. In 1927 he talked a high school coach into letting him be the first man—more accurately, the first boy—ever to film an entire football game for purposes of analysis and self-improvement.

For information about color photographic materials for recording work, write

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PHOTO METHODS IN USE

Photographers doing close-up and copy work must increase their exposures to compensate for the increased lens extensions (lens-to-film distance). Most published methods of computing the required increase involve mathematical formulae or are limited to one f/stop-speed combination.

The simple method outlined here, however, uses an exposure meter dial as a handy calculator for all close-up work.

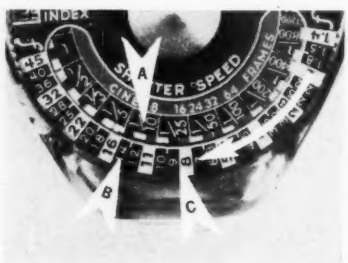
Here is a sample problem but the method can be applied to any lens extension or focal length. First, take a light reading of the subject and adjust the exposure dials for normal exposure. Next, measure the lens extension from the film plane to the center of the lens. In the example illustrated, this distance is 14 inches. Locate number 14 on the f/stop dial and note the shutter speed opposite this number. In this case, it is 1/10.

Now, move the shutter speed dial until this speed mark (1/10 sec.) is opposite the f-stop number which is the same as the focal length of the lens you are using. In our example an 8 inch lens was used, so the black square of 1/10 sec is moved opposite the f/8 mark (See arrows in the figure at the bottom right.)

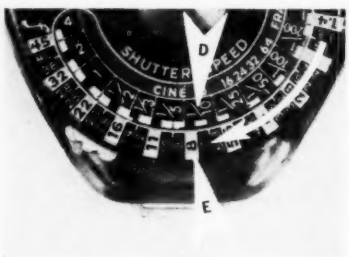
The bellows extension is now compensated for and any set of f-stop and speed combinations indicated may be used. As you can see the whole procedure is much easier to do than it sounds and is 100 per cent accurate.

In the example shown, a Norwood meter was used but this method is applicable with any exposure meter using a calculator dial.

If you feel uncertain and want to check your result, you can use standard optical formulas, found in any basic photographic books. This system will work with any close-up problem no matter what the scale of reproduction may be, from 10:1 to 1:10. A handy rule to remember if you do 1:1 copy work is that at this distance, the bellows extension is double the focal length of your lens and the exposure factor is 4X or two f/stops. In the case of the example illustrated here, it would be f/16 instead of f/14.



Meter setting for normal exposure.



Meter setting for close-up exposure.

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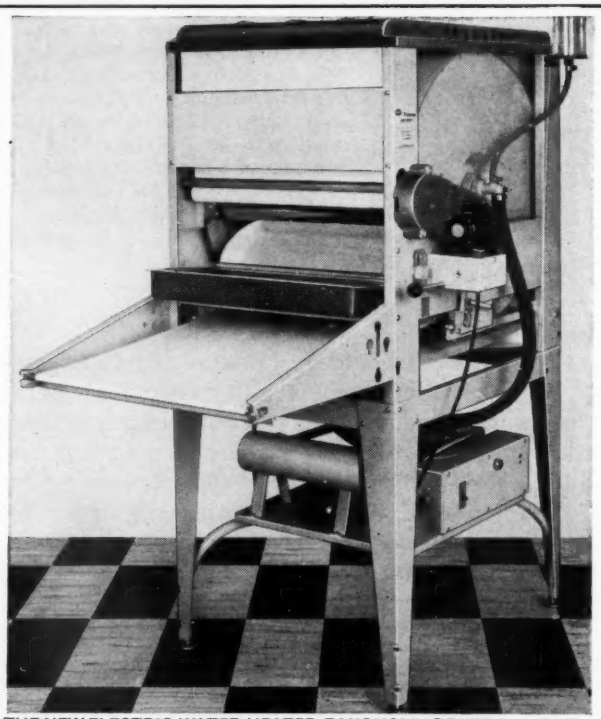

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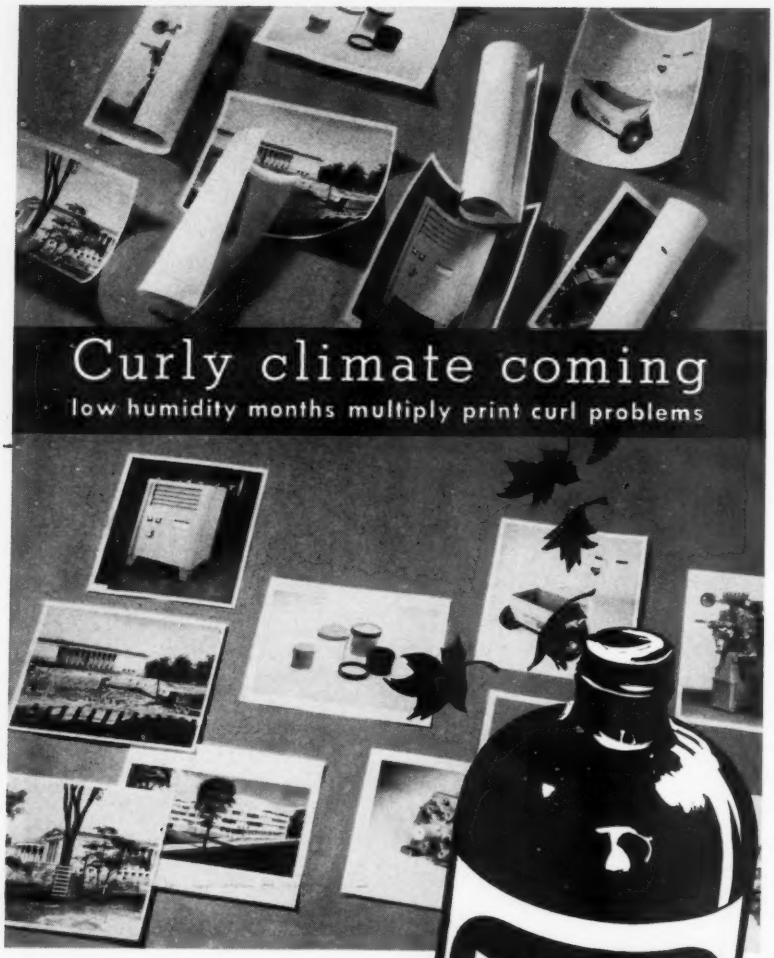
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(*continued from page* 47)

works—Miss Elsie Garvin of the Kodak Research Laboratories and Mr. Victor H. Allen of the Society of Motion Picture and Television Engineers.

The professional societies

It seems almost self-evident to me that the most effective way of working out the problems that beset this field would be to consolidate the many efforts for its betterment in a single, effective group.

The picture of professional society activities in the United States today presents anything but this. In 1960 the calendar has been thus:

May, Los Angeles, Society of Motion Picture and Television Engineers (one day of papers on high-speed photography).

May, Los Angeles, Society of Photographic Scientists and Engineers.

July, Chicago, Professional Photographers of America.

August, Los Angeles, Society of Photographic Instrumentation Engineers.

August, Cambridge, Mass. MIT course in high-speed photography.

September, Madison, Wis. University of Wisconsin Short Course in High-Speed Photography.

October, Washington, Fifth International Congress on High-Speed Photography. Society of Photographic Scientists and Engineers, Symposium on Processing.

It is a lengthy gamut for the professional scientific photographer to run. Furthermore:

1) Each society competes with the others for papers in scientific photography. This lessens the effectiveness of each program.

2) In equipment shows, manufacturers must spread themselves thin; I think too thin.

3) In only the rarest cases could travel orders be secured for all the above, and even if they could, the economic justification would be pretty far-fetched. The attendance for anyone is necessarily limited, and almost everybody can be sure he is missing some valuable information—perhaps the most valuable in terms of his own work.

I strongly believe in a consolidation of these efforts. I believe that scientific and engineering photography is at a point where its practitioners should gather in a single, more effective professional society.

Photographic instrumentation is not confined in its usefulness to re-

(*continued on page* 106)

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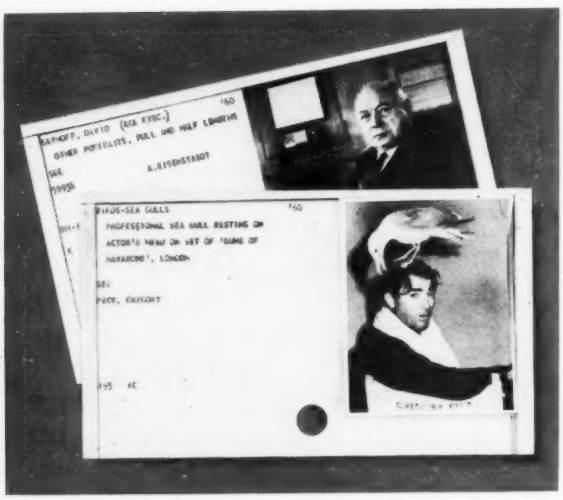
KM
NEW YORK

Wallace Hanson, Editor,
Photo Methods for Industry, 33 West 60 Street, New York.

In 9 halls each size of giant dirigible hangar 551 firms from all over world showing amazingly versatile auto exposure electric eye 35mm rangefinder and reflex, 2¼, and movie cameras which do all but talk. Many of same firms also introducing advanced, versatile equipment for photographer who wants to think for himself. Examples: with Rollei-Magic 2¼ twin-lens reflex just focus and press shutter release for perfect pictures; Savoyflex 35mm leaf-shutter reflex has complete electric eye and manual operation plus speeds from one to 1/500 sec., 50mm f/2.8 lens, fully automatic diaphragm which reopens after exposure and rapid-return mirror. New Agfa model is Optima twin-lens 35mm reflex with eye-level prism and full electric eye operation. Five tiny hearing aid batteries in Wirgin automatic 35 leaf-shutter eye-level reflex set all shutter speeds and apertures for year without replacement. Praktina and Praktica have built-in meters. Leicina by Leitz is elegant all-electric through-lens focusing 8mm movie camera which looks like tiny TV camera. Zoom Leicina using fantastic Schneider Variogon 8 to 48mm lens will follow. Leitz also introducing 35mm f/1.4 Summilux lens for Leica. Zeiss entering f/1.4 realm with new 58mm Planar for Contarex. Additional Contarex model called "Special" with interchangeable hood, prism, ground glass but no meter now officially introduced. Both models and Contaflexes can accept new daylight-loading interchangeable magazine film backs. Pentax has three new 35mm eye-level focal-plane-shutter cameras. One has mercury-battery-powered three-degree viewing angle exposure meter built right into the camera body. It works through camera lenses. Same meter available as hand-held accessory with dual sensitivity scale. Pentax with meter is barely larger than camera without meter. All Pentaxes have fully automatic instant-reopening diaphragm. Canon showing non-interchangeable lens rangefinder, full electric eye camera with additional complete manual control. Caught glimpse of Canon VII rangefinder camera with built-in meter and 50mm f/0.95 lens. Petri has major advance in rangefinder for reflex cameras. Can you imagine 2¼ x 3¼ and 4 x 5 single-lens reflexes of very light metal with focal-plane shutter 6 seconds to 1/1000 which you can couple to monorail and bellows unit for almost full swings and tilts and close-up work? Lensboards are instantly interchangeable. It's Swiss Arca. Linhof Press for 70mm and 2¼ x 2¾ has rapid wind lever which also cocks interchangeable lens and shutter automatically. Lenses for reflexes headed by Enna f/4.5 zoom lens from 85 to 240mm. Schneider and Isco lenses for Exakta have removable but coupled exposure meter. Rollei projector takes 2¼ slide trays one side, 35mm on other, is completely automatic with remote control focusing. Color films are brighter, truer, sharper, and may hit U.S. market sooner than you think.--End.

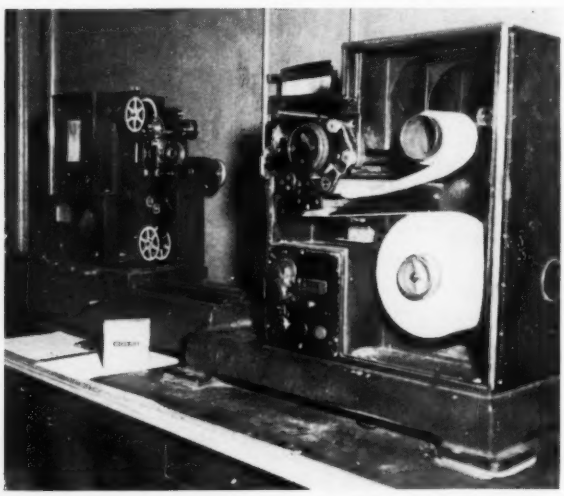
Wolfman, Keppler, Grossman, Meyers, Farber--PMI's
Editors at Photokina

SPEAKING OF PICTURES



Cards compress photograph as large as 11 x 14 plus its caption, microfilm roll number, cross index data, date, credit line to 3 x 5 size. *Life* has about 35,000 of them.

A member of the *Life* library staff does the actual microfilming of prints which should be kept in active file. It's a 35mm Recordak loaded with Panatomic-X.



Optical printer enlarges the microfilm negatives five times for 3 x 5 prints. Roll paper is No. 1 Kodabromide specially ordered on heavy card stock to prevent curl.

In-line processor grinds out file card prints. Dryer must be slowed to handle heavy paper. First manual then printer's trim follows. Negatives can yield reproduction prints.

A library of photographs is a challenge that admits to no pat solution. They are bulky, usually of irregular size, and are fragile besides. They defy concise description; yet they must be reduced to words in order to classify them. Here's how *Life* magazine handles them, using 3 x 5 index cards printed photographically

The expert librarians at Time-Life, Inc., have a method for referencing photographs that solves most of unusual problems a photo library presents. So far it has been applied to some 50 per cent of current cataloging in the *Time-Life* file is done by means of 3 x 5 cards. Each card bears a picture, caption material and cross index data.

The cards are made by microfilming original prints along with their caption material, then blowing the microfilmed images back to the 3 x 5 card size. In all, the cards cost about a nickel apiece, and make picture research at *Time-Life* a good deal easier than digging through mountainous files.

The library cycle starts when Doris O'Neil, in charge of the Picture Library, reviews all new, incoming *Life* photos, selecting those to be added to the active picture file.

The selected prints are cataloged and all pertinent data on the story typed on white bond paper using a typewriter with an especially large type face, a Royal with 18 point (¼ in.) type. A black ribbon is used.

The system revolves about one basic piece of equipment at *Time-Life*, a Recordak Model D 35mm unit. Illumination for this unit is supplied by four reflector flood bulbs on a 40-volt line (the line voltage is reduced by means of a variable resistance in the line). The film used is Pantomic-X in 100-ft. unperforated rolls, processed automatically by Recordak.

The typed data and the selected print are then photographed together on the Recordak unit. Reduction ratio is standardized at 18X. An 11 x 14 print and type can be covered sufficiently using this ratio. A fixed easel on the baseboard is used, made from a white wooden frame. If the print and caption are too large, the operator uses his judgment in cropping. In some cases, caption material may be placed over an unimportant area.

Picture runs are twice weekly, Mondays and Thursdays at 3:30 p.m. The actual filming is supervised by Joseph Schilling and this system processes the average weekly load of 350 pictures in a few hours. After the run, the exposed film, about 20 feet long is cut off, removed from the camera and sent to Recordak's New York lab for processing. The film is developed by the following morning. Finished cards are delivered that afternoon. Recordak prints the microfilm with an optical printer said to be the only one of its type in existence. The blowback is at 5X enlargement, giving a print whose horizontal measurement is 5 in., the long side of a 3 x 5 index card. Card stock Kodabromide used with this printer, is processed in an in-line automatic print processor, its dryer slowed down to make sure the heavy prints do get dry. The rolls are cut apart by hand with a standard paper cutter and piled into stacks of 50 for final trimming, to 3 x 5 size, with a printer's paper cutter. Back at *Life*, a hole is punched at the bottom of the card to permit passing a filing rod through the cards. The film is kept on file at *Life*.

The Panatomic-X film is processed under the same conditions as regular Microfilm. With regular microfilm developer, the negatives reach a gamma of 1.0 and must be printed on F1 Kodabromide stock.

The choice of film and paper was made by Recordak. Panatomic-X gives adequate print quality and permits pictures to be made from the copy negative if needed. Enlargements can be made by *Life's* labs from copy negatives if they are needed.

Special paper stock, purchased in bulk from Kodak, is used. This was necessary because doubleweight paper had a tendency to curl.

Cost of this service based on the present volume of 350 prints a week is five cents, including processing. This system has worked out very well for *Time-Life*. A reporter or researcher looking for a specific photograph can make a quick selection in cases where there are more than one picture of the same subject. It is almost the perfect file system for a picture library, offering compact storage, low-cost records and quick retrievability.

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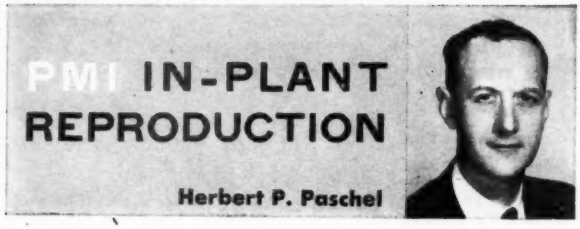

GRAPHIC ARTS

A short course in the theory of line and halftone for photo men

The aim of photography is essentially to reproduce as accurately as possible the brightness range of a subject. Although continuous tone negatives can record brightness ranges of 1000 to 1, photographic papers are limited to a range of 50 to 1 at best. This obviously calls for compromises which the experienced photographer makes by choice of sensitive material, exposure and development.

The working knowledge gained in handling continuous tone materials cannot, unfortunately, be applied directly to line and halftone photography. The attempt to do so accounts for many of the problems encountered when othewise competent photographers first try to make line and halftone negatives.

Line and halftone negatives are no more than stencils which control the printing and non-printing areas in the subsequent platemaking operations. As such, they require an extremely high density in the non-printing areas and zero density in the work areas. A line negative must be a perfect delineation of the type, lines, etc., to be reproduced. A halftone negative, which simulates tones by varying the paper and ink relationship by means of dots, must likewise properly divide the areas of minimum and maximum density. Obviously, the requirement in line and halftone photography is to produce the proper division of image and non-image areas in a purely physical sense. This is quite different from the objectives of conventional photography. It not only requires special materials and techniques but an entirely different approach to the concept of exposure and development.

Special emulsion

A special emulsion has been created for photomechanical use which differs considerably from conventional tone materials. A comparison of a family of characteristic curves (*Figure 1*) reveals that the typical "lith" emulsion (Kodalith, Litholine, Photolith, Reprolith, etc.), has a very short toe and a very long and steep straightline portion. Undoubtedly, such an emulsion is not intended to record a full range of tones. Instead, it is apparent that its function is to transform a low brightness difference into a much greater density difference.

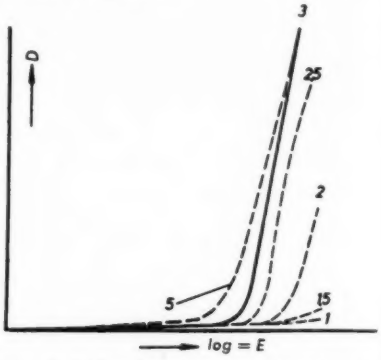

Fig. 1 A family of curves showing the inherent density and contrast potential of a number of emulsions.

The maximum values of which such emulsions are capable are not realized, however, unless they are processed in a lith type developer. While there are many proprietary developers on the market whose exact composition is not known, their function is usually similar to the well known paraformaldehyde solution. This consists of sodium sulphite, paraformaldehyde, potassium metabisulphite, boric acid, hydroquinone and potassium bromide.

Unlike tone developers which are intended to reduce silver in proportion to the intensity of exposure, lith developers are designed to intensify development out of proportion to exposure. Although the chemical reactions are complex, a simplified explanation is the following. In the emulsion areas that have been exposed, the primary development action creates certain oxidation by-

(*continued on page* 70)

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GRAPHIC ARTS

(*continued from page 68*)

products. These have a development potential even greater than the initial solution. This secondary development reduces the less exposed silver grains not reduced by the primary action. As the reaction progresses more and more silver halide crystals are reduced. Thus, wherever the exposure has been high enough to initiate primary development, the secondary reaction adds density.

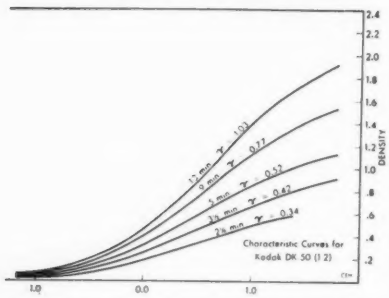

Fig. 2 The characteristic curves of a continuous tone emulsion show a gradual and even increase in density and contrast with increased development. A 30-second error in development time would not be harmful except in extremely critical applications.

This singular property of lith developers—the ability to accelerate, or intensify development—is effective only within narrow limits of development time. With under-development, the secondary reaction may not get started at all, resulting in a weak image. With over-development, more and more silver grains will be reduced. These, however, will not necessarily be in the areas where high density is desired, but rather in the areas of low exposure. Thus, prolonged development will lower negative contrast.

With tone developers the increase in density and contrast with increased development is a gradual process (*Figure 2*). The transition from a low to an accentuated density can occur within a matter of seconds with lith developers (*Figure 3*). It follows that best results will be obtained with lith developers by rigid adherence to the developing time found to give optimum negative quality. This also means maintaining the developer at the prescribed temperature and not varying the method of agitation.

With few exceptions, platemaking processes do not permit compensating for negative errors. Obviously, this calls for a high degree of accuracy and coordination in the exposure and development of the negative. Although there is more latitude than the tone of this article suggests, such latitude is available only in advance of exposure and development. In short, you've got to know your material and process well enough to predetermine the exposure-development combination that will produce the result you want.—THE END

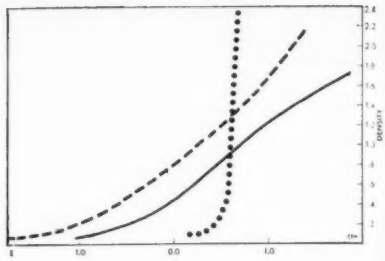

Fig. 3 Development of a lith emulsion in paraformaldehyde developer from 1 to 5 minutes. The curves show that optimum density and contrast is attained within the 2½ to 3-minute range, after which continued development only lowers contrast and obliterates fine detail.

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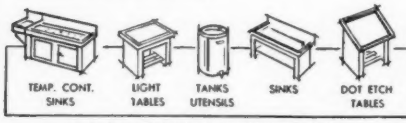

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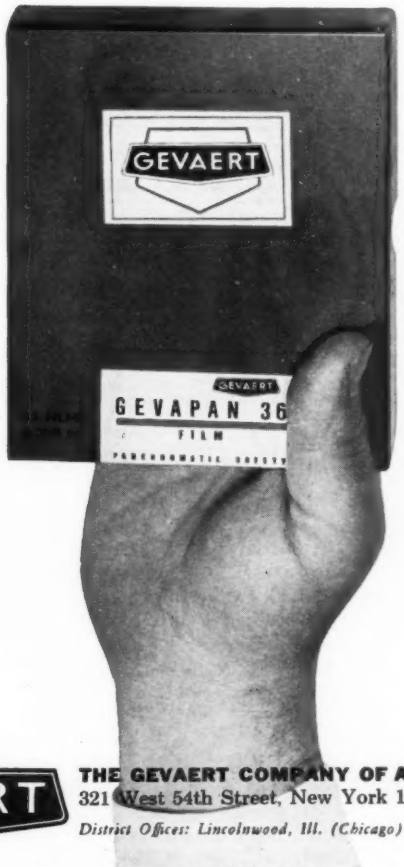

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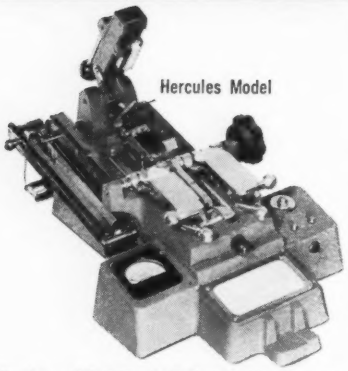
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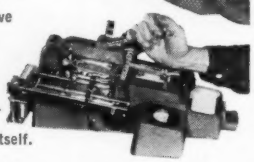

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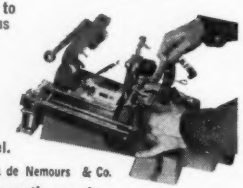

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PMI IN-PLANT REPRODUCTION

Vernon Tate

MICROREPRODUCTION

Quality standards for microreproduction of text and line: Part II

In the preceding column, aspects of the concept of resolution as it has come to be applied in microphotographic reproduction were discussed. Mention was made of the National Bureau of Standards "Microcopy Resolution Test Chart" (Standard Sample 1010) which is a convenient tool, when properly used, to make resolution determinations. With a suitable microfilm camera, properly adjusted and focused, equipped with microfilm, resolution charts can be photographed at varying ratios of reduction and the results interpreted in terms of lines/mm of "resolution."

The NBS test chart is not the only pattern available. Those, for example, devised by Sayce, Cobb and others as well as the gratings employed by Mees, Sandwick and others have been used with success. Most operate on the principle of providing several selections of patterns with lines of equal width separated by spaces of the same width. The NBS pattern has been described in detail and used as a basis for discussion because it is typical, useful and easily procured.

In the instructions which accompany the NBS resolution charts, three grades of reproductions, termed sufficient for the needs of practical microcopying, are defined as: **1** Excellent copy—details of type clearly defined. **2** Legible copy—readable without difficulty; serifs and fine details of copy not clearly defined. **3** Decipherable copy—readable with difficulty; letters **e, c** and **o** partly blocked or closed.

These are correlated as follows: **1** Excellent copy—height of lower case **e** on the film reproduction should not be less than the distance across eight lines of the smallest pattern resolved. **2** Readable copy—height of **e** not less than distance across five lines of smallest pattern. **3** Decipherable copy—height of **e** not less than distance across three lines of smallest pattern.

As an example, a newspaper on which the height of the smallest **e,** no doubt on the stock market or classified pages, was 1.5mm; copied at X19, excellent copy would require 101 1/mm, readable copy 63 1/mm, and decipherable copy 38 1/mm. If these values were plotted as a curve, the figure would be quite interesting. Some illustrations pertinent to these figures will be found in the article by Rudd listed at the end of this column.

The best is good enough

The obvious comment on the foregoing evaluation is that only the best microreproduction that can be made is acceptable. In this connection, microreproduction can be compared to the famous definition credited to a noted engineer that "an airplane is a technological anachronism that almost doesn't fly." This much is certain; once a microreproduction is made, no known subsequent aftertreatment will improve its resolution.

The NBS appraisal moreover is based on the reproduction of printed originals. In general, these are easy to copy and offer few problems although some with experience on old newspapers might not agree. Good evenly inked letterpress of sharp definition well-printed on white paper is the ideal subject for the microfilm camera. Unfortunately, most originals have had little or no connection with the printing press. There are handwritten manuscripts of all sorts, typescripts, engineering drawings, commercial paper often covered with entries made with rubber stamps, photographs, maps, charts, the products of many duplicating processes and a host of other kinds of originals. These may be in ink of any color in the rainbow, in pencil or other medium, on paper of all colors imaginable and they may be soiled, smudged, stained, faded,

(*continued on page* 74)

Miniaturization Report No. 1

What price automation?

In view of today's rising costs, the need for automation in the processing of engineering drawings is recognized as necessary. However, in the welter of claims and counterclaims for various miniaturization processes, a good deal of confusion has arisen around the relative merits of the 35mm and 105mm systems.

These facts need stating: Automation should not dictate film size; conversely, film size should not dictate whether or not automation is possible.

To clarify these points: One should not necessarily install a 35mm system on the assumption that it is the sole answer to high speed automated reproduction. To do this is to overlook the fact that the 105mm system is also capable of automation. And 105mm can often be automated without the expenditure of large sums of money for new processing equipment.

Both systems—35mm and 105mm—have their place in the modern engineering reproduction department. (The K&E MICRO-MASTER® Camera-Projector takes and projects *both* film sizes.) However, if automation is the only basic consideration, the case for 105mm needs further emphasis.

For example: 35mm aperture cards for information retrieval are designed to deliver negatives quickly and automatically. General practice, however, is to key-punch both the aperture card and a companion "tracer" card to prevent excessive negative wear in sorting. Selection of the aperture card is manual. (Tracer cards also provide 23 additional key-punch positions.)

Tracer cards can also be successfully used with a 105mm system. And only one card need be punched. Selection of negatives, as with aperture cards, is manual.

From start to finish, let's see how the two systems compare:

35mm	105mm
• Negatives in aperture cards • Punch-card retrieval • Automatic "dry-process" reproduction	• Negatives in archival envelopes • Punch-card retrieval • Standard diazo reproduction
PREPARATION AND FILING	
Original drawing photographed to yield master negative	Same
Tracer card key-punched	Same
Aperture card key-punched, negative inserted in card	Archival envelope machine numbered, negative inserted
Tracer cards and negatives filed	Same
SEARCH AND DELIVERY	
Tracer card sorted to find location of negative	Same
Negative selected manually from file	Same
REPRODUCTION	
Distribution prints made from negatives on automatic "dry-process" printer at rate of 20 ft. per minute.	Prints made from photographic intermediates on diazo machines at 60 ft. per minute. (Time spent in preparing intermediate offset by faster print speed of diazo.)

SUMMARY:

- Despite minor differences in procedure, preparation and filing take almost equal time (a matter of minutes).
- Search and delivery take exactly the same time.
- In production, printing speed using 105mm negative and standard diazo is *as fast* as automatic "dry-process", or *faster*.
- In short: both systems offer roughly equal speed and convenience.

Undoubtedly, if you are at all involved in engineering reproduction, you will require more facts than could be furnished in this brief message. We have them—complete with cost comparisons—and will be pleased to furnish them if you will return the coupon below.

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MICROREPRODUCTION

(*continued from page* 72)

aged or deteriorated from any one of many causes. The combinations are nearly endless. The problem is to secure the best possible microreproduction usually in terms of a rather stringent budget that is suitable for a particular purpose. Resolution at once becomes only one of a number of inter-related problems.

It is easy and relatively straightforward within the limitations previously described to ascertain values for the resolution available with a given camera set-up, film and processing cycle. From this point onward, density here used to refer to the degree of blackening of the photographic image or any part of it, and contrast, which designates differences between parts of an image, play increasingly important roles.

Resolution can only be understood in terms of basic photography. Simply stated, compounds of silver will react to light to produce, when processed, chemical changes proportional to the amount of light falling upon them. The silver crystals are very small; suspended in an emulsion on a base support they are exposed in a camera to produce a latent image which, when processed, becomes visible and permanent. This is photography, a marvel now so commonplace that it is taken for granted, which does not mean that it is not worth much thought and reflection. The full story so far as presently known fills many volumes and numberless articles.

For our purposes it would be ideal if all images of fine lines could be completely transparent in the negative and with the dividing line between transparency and opacity sharp and distinct. It is not, unfortunately, the case. For various reasons the silver crystals are affected in ways that decrease sharpness. The term "acutance" has been employed to describe a value of image sharpness. The classic experiment involves printing a knife edge on a sensitive material and plotting the density gradient across the resultant image. The image migration is clearly apparent. Additional study could well be devoted to the dividing line.

These factors provide some useful hints to the reasons for the difficulty of making a subjective reading of a resolution chart, and why higher resolution may result in *lower* readability. An interesting method for analyzing the factors of readability has been devised; it is my topic for discussion next month.—THE END

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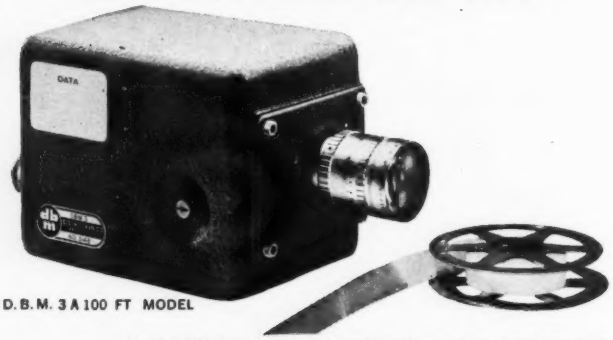

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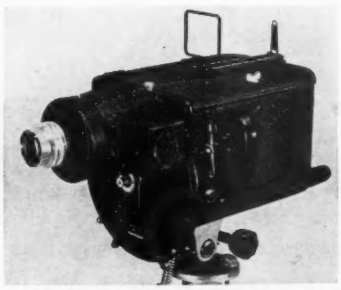

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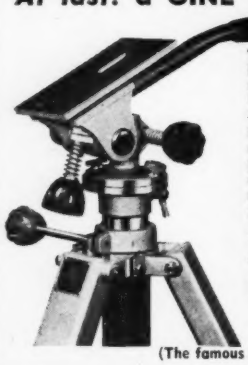

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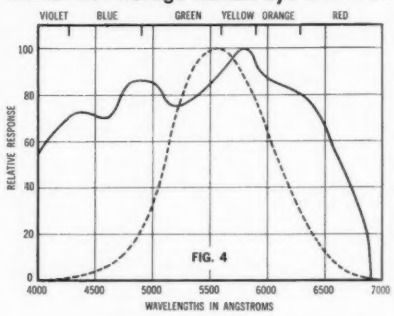
RESEARCHER'S REPORT
(*continued from page* 41)

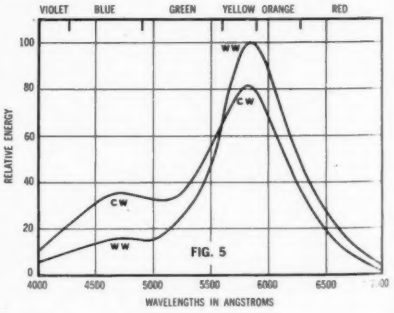
equated by an instrument (the eye) having the sensitivity shown in Figure 1. An instrument having different relative sensitivity would not consider the lamps to have the same color. For instance, the relative response of one type of color film is shown in Figure 4, compared to the eye response curve. It is evident that the film "sees" color differently than does the eye. Correction by means of filters becomes more difficult with fluorescent lamps because of the different shapes of their SED curves and because of the presence of the mercury lines.

Fig. 4 Response curves: A color film ———. Average human eye — — — —



The problem is further emphasized by a comparison of the curves in Figure 5. In these curves the mercury lines have been omitted to avoid confusion. If these lamps were given color temperature ratings, the warm white would be 3000K and the cool white would be 4200K. The lamps appear different, but the difference will be "different" when seen by the color film in Figure 4.

Fig. 5 SED curves: cool white (CW) and warm white (WW) fluorescent lamps. Mercury lines have been omitted.



For a final example, consider the curves in Figure 6. The cool white lamp and the deluxe cool white lamp look alike to the eye; and if they were to be given a color temperature rating it would be 4200K for each. The lamps seem alike to the eye;

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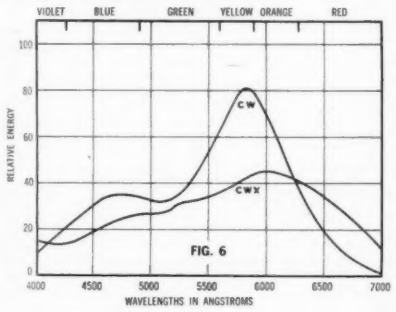
therefore they cannot seem alike to the color film shown in Figure 4. All of these considerations are still more pointed in regard to mercury vapor lighting. Color improved lamps have most of their energy and clear lamps have all of their energy in the mercury lines. Thus they are so different from a black body that color temperatures cannot even be applied from a visual standpoint.

In summary, it would be proper to give color temperatures for fluorescent lamps, because color temperature is based upon the appearance of a luminous source to the eye. However, it is meaningless to apply color temperatures to fluorescent lamps for purposes of color photography. Lamp companies, therefore, gave up the color temperature designations a number of years ago to avoid confusion to photographers. Reliance must be placed upon specific filter recommendations and bracketing of shots instead of on color temperatures. Such recommendations have been published from time to time by lamp manufacturers and film manufacturers.—THE END

Fig. 6 SED curves, cool white (CW) and deluxe cool white (CWX) fluorescent lamps. Mercury lines have been omitted.



The foregoing article commences a series on matters affecting the in-plant photographers which the editors of PMI hope to elicit from members of research laboratories in the photographic industry.

Author of this first article is Willard Allphin, Illumination Research department, Sylvania Lighting Products, Boston. Mr. Allphin is an electrical engineering graduate of MIT, a fellow of the Illumination Engineering Society, a member of the Illuminating Engineering Research Institute and the International Commission on Illumination. He is the author of Primer of Lamps and Lighting *and indulges himself in his hobbies of music, photography and woodworking.*

Readers are invited to suggest topics for these discussions.

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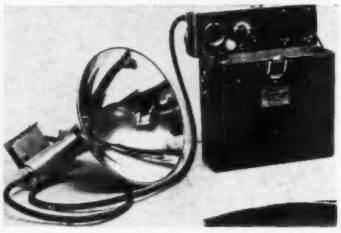

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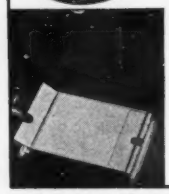

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DOUGLAS AIRCRAFT

(*continued from page* 56)

val and an IFPA award for "best training film for 1959."

In connection with these awards, of which all members of the Film Service Group are very proud, Scott gave us his views as to the specific functions he feels films should fulfill: "Douglas Aircraft Company is not in the motion picture business. A film to us is an important instrument to further the state of the arts of the aircraft and missile industry. We are in the aircraft business, not in the film making business. Consequently, films must do a job for the company and that is the sole reason for the existence of this group. If the films we make are also handsome and win prizes and awards, naturally we are proud and happy. We make films with what I would call a rifle approach, rather than a shotgun approach. We have to hit a specific target. I think one reason we are sucessful and held in high esteem within the company is this approach of ours. There used to be a time when we had to 'sell' our capabilities—now management and engineering management come to us with film requests."

In on the ground floor

As a matter of fact the Film Service Group now is called in for consultation at some of the very first staff conferences of a new project to see what the group can offer in the planning stage. A representative of the group is always in close liaison with all proposal planning groups, since motion pictures actually form a required part of proposals.

To bring before the general public the Douglas story, great emphasis is being placed upon TV film clip production and distribution. A public relations department contact man is specially assigned to supply the various TV networks, as well as Fox Movietone Newsreel and Telefilm with film clips. These are shipped to the various outlets in specially imprinted envelopes and the TV film clip service has enjoyed considerable success and acceptance. The clips are shown on regular newscasts, on topical news analysis programs and in feature type shows. During the past year 53 of these releases have been produced. Requests for stock footage by theatrical and TV film producers are serviced whenever possible with high-quality footage of Douglas products in action. Important highlights, such as missile flight tests of an unclassified nature, are shot ex-

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pressly for release to local and national TV networks and other newsreel releasing agencies.

The personnel and equipment facilities of DAC Film Services are very well suited to fulfill the diversified nature of the film productions which are demanded of the group. Among the 40 people employed in the group are cameramen, editors, film control personnel, film librarians, writers, directors, production coordinators, gaffers, electricians, maintenance personnel, as well as the required secretarial force to back up the operation. The group's equipment would set a small independent film producing company to drooling: 35mm Arriflexes, 16mm Arriflexes, Auricon Pro 600's, Bolexes, Bell & Howell 70 DRs and 70 DHs, Mitchells, Eastman Cine Specials—all with full sets of lenses and accessory equipment—are on-the-shelf items. In addition to these cameras, the group rents specialized equipment such as Fastaxes, Photo-Sonics, Fairchilds and other high-speed equipment when needed. The array of equipment is backed up by a rather unique generator-lighting truck carrying enough lighting units to allow filming anywhere, anytime, independent from local power supplies. This truck often is airlifted to remote locations.

Yearly budget

The budget for the Film Service Group averages about $750,000 per year, which includes all contractual requirements, advertising, engineering support, instrumentation and public relations. About 70 per cent of the total Film Services budget is spent producing films for the Army, Air Force, Navy and NASA.

The other 30 per cent is accounted for by company sponsored sales promotion films, public information films, TV releases, training films, reports and engineering studies.

As efficient a unit as the Film Services Group is, it has been found through cost studies that it pays them to spend about 50 per cent of their budget with outside vendors in obtaining processing, printing, animation, sound and editorial services.

At the present time the Douglas film library has nearly 1000 release prints, representing 187 different productions, available for distribution. Ten film titles, printed on 650 release prints, are nationally distributed to service clubs, schools and other interested organizations through Modern Talking Picture Services and Sterling Films, Inc.

Just recently more management

(*continued on page 82*)

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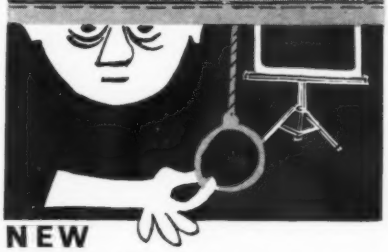

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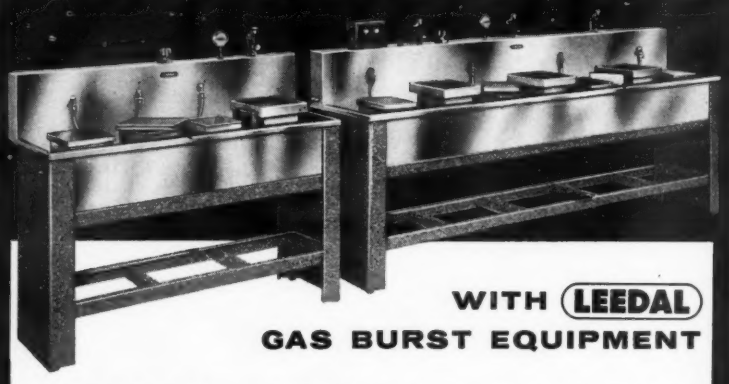

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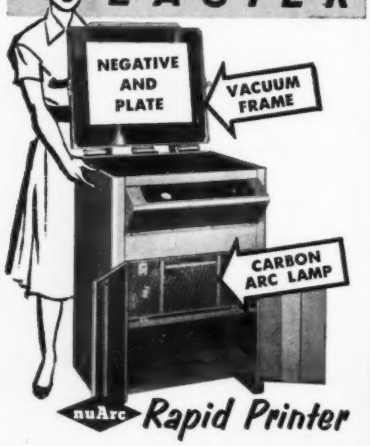

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DOUGLAS AIRCRAFT

(*continued from page* 81)

recognition was given indirectly to the group with an executive order appointing Robert Scott, the administrator, to overall control of all photo and film activities of all divisions of the company. Where in many other companies the photo department heads are at least in nominal charge of the in-plant motion picture departments simply because in-plant "photo" has been around industry longer than in-plant 'film", at Douglas Aircraft Company, it's now the newer art of motion pictures which is in charge.

"We have come a long way since I started this group—or rather *was* the group—in June 1953. Me and a Filmo were going to do all the work around here," said Walt Tufts, the Chief Cameraman. "I wouldn't have thought in those days of production figures such as our output for 1959, when we produced complete films running a total of nearly 19 hours—and every foot of it shot by the Film Services Group."—THE END

MANAGEMENT MEMO

(*continued from page* 51)

were made, both in terms of what photography can do and in terms of a basic photo course for engineers and others who need photographs on an occasional basis and who take the picture themselves.

There were virtually no serious headaches reported from equipment and materials. A few comments were made about the slow service offered by photographic supply houses. This made it necessary to keep larger inventories on hand. As far as equipment was concerned, apart from a few personal objections, such as to bottom-loading 35mm cameras, the section chiefs were satisfied. However, they did not deny the possibility of improvement in operating convenience and versatility. One manager particularly liked interchangeable backs and hoped for a wider range of zoom lenses which reduce the need for a battery of telephoto optics. Another man felt that some types of cameras such as view could be a little sturdier.

These, then, are some of the complaints photo department managers have. The headaches they cause vary in duration and intensity but not one manager queried would want to leave photography for any job on an approximate salary level. What more could a harassed executive want?—THE END

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CAMERA & LENS

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Fostoria Corp. Bulletin discusses advantages of plastic lenses over glass lenses.

OSCILLOSCOPE TRACE RECORDING 202
Electronic Tub Corp. 20-page article on Oscilloscope Trace Recording with Polaroid Land Photography. Includes a comprehensive listing of cameras, lenses and techniques.

CAMERAFLEX 203
Federal Mfg. & Engineering Corp. Illustrated specification sheet describes Cameraflex 35mm and 16mm custom design movie cameras with reflex-type viewfinder and Model 433 35mm boresight camera.

WADDELL CAMERAS 204
Camera Equipment Co., Inc. Three catalog sheets list Waddell high-speed motion picture cameras and auxiliary equipment.

DATA RECORDERS 206
Vought Camera Co. Illustrated brochure describes photographic data recorders, various types of photographic equipment.

RESOLUTION TEST CHART
Craig Corp. Motion Picture Research Council Resolution Test Chart will be sent to all who send in requests on company letterhead to Craig Corp., 3410 S. La Cienega Blvd., Los Angeles 16, Calif.

OPTICAL INSTRUMENTATION 209
Remanco, Inc. 4-page article *Are We Falling Behind in Optical Instrumentation?* reprinted from Ground Support Equipment.

KERR CELL CAMERA 207
Electro-Optical Instruments, Inc. Illustrated specification sheet describes the Model KSC-51 high resolution camera with effective exposure as brief as five millimicroseconds. Manufacturer claims resolution better than 70 lines/mm with 6-in. focal length lens.

EQUIPMENT

RADIANT SCREENS 212
Radiant Mfg. Corp. 12-page illustrated folder describes Radiant projection screens in 23 sizes, 13 different models. Complete specifications, prices.

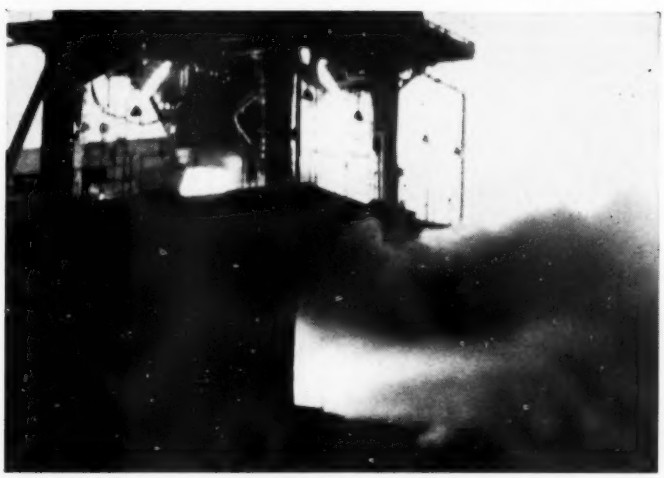
MICROFILMING UNIT 213
Camcopy, Inc. Folder and fact sheet describe the Camcopy Copiflash, a portable 35mm microfilming unit with built-in light source. Includes prices.

COLOR PROCESSORS 214
Rolor Industrial Corp. 20-page illustrated master catalog describes new Rolor line of color processors, details with installation diagrams Rolor gas agitation systems, outlines automatic replenishment systems, processing laboratory components.

PROJECTION PRINTERS 215
American Photographic Appliance Corp. 10-page illustrated booklet describes APAC projection printers, automatic roll paper easels, contact printers, Foto-Ident, Photo Eye Timers for production work.

(*continued on page* 83)

AUTEX* catches the flame

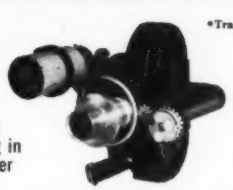


A film sequence of a rocket engine test properly exposed from countdown to flame-out dramatically demonstrates the AUTEX Automatic Exposure Control as a new and versatile tool for the photoinstrumentation engineer. Coupled to any lens this photosensitive servomechanism corrects for light changes as fast as 7 stops per second to record the unexpected along with the normal.

Used on airborne cameras, unattended time lapse cameras, and surveillance cameras, the AUTEX adds a new flexibility to the growing usefulness of photoinstrumentation.

The new Model VI-4 AUTEX is a typical product of the combined photographic and electronic instrumentation abilities of Flight Research. For detailed information concerning the AUTEX and Flight Research's complete line of photoinstrumentation equipment, write to:

New Model VI-4 AUTEX Automatic Exposure Control—Fitting any camera and any lens, the Model VI-4 AUTEX has these new features . . . easily cut cam to match the f/stop scale of any lens . . . limit switches to prevent over-drive of the lens . . . photocell designed to mount at the camera or at the subject . . . subassembly construction to simplify special mounting in small space . . . complete redesign to increase reliability under severe environmental conditions.



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FLIGHT RESEARCH INCORPORATED

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Richmond 1, Virginia

Get more information. Circle 444, page 87

FOR THE *finest* in COLOR or Black & White

specify HE

The Laboratory that's OLDEST in experience... NEWEST in equipment!

We offer a complete 16mm laboratory service in color and black-and-white, including Eastman Color inter-negative and positive processing, plus additive scene-to-scene color printing on new Bell & Howell color additive printers.

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HOLLYWOOD FILM ENTERPRISES, INC.

Serving Film Producers since 1907

6060 SUNSET BOULEVARD • HOLLYWOOD 28, CALIF.

Get more information. Circle 456, page 87

FREE LITERATURE

(*continued from page 83*)

WATER HEATER 210
Portmar Water Heater Co., Inc. 4-page illustrated folder gives complete specifications on 14 sizes of the WH series volume water heaters.

COLOR FILM, PAPER PROCESSOR 211
Murmatics, Inc. Folder diagrams, explains, gives prices on Model 5, 5-B and Custom Line automatic color film and paper processor.

FILM PROCESSING 216
S.O.S Cinema Supply Corp. Brochure lists new line of custom-built film developing machines made by Filmline Corp. Negative, positive, reversal and color in 16, 35 and 70mm models.

MICRODENSITOMETER 217
Ansco. Illustrated brochure and specification sheet describes the new Automatic recording Ansco Microdensitometer.

LAB EQUIPMENT 218
Kreonite, Inc. 12-page price list and specifications for plastic-impregnated glass fiber sinks and processors.

LAMP PERFORMANCE CHART 219
Natural Lighting Corp. Performance chart for lamps boosted with ColorTran Converters. List includes 14 lamp types, with intensity and coverage provided at different distances, at both 110 and 220 volts input.

FILTER CATALOG 220
Commercial Filters Corp. 8-page catalog includes a variety of filters and filtration systems for liquids and gases.

SILVER RECOVERY 221
States Smelting & Refining Corp. 12-page catalog of silver recovery equipment includes specifications and useful data for film processors.

BINDING BOOKLETS 222
American Photocopy Equipment Co. 8-page brochure describes the Apeco Com-Bind, plastic punching and binding machine for desk-top operation.

SKYDROP 223
Krank-N-Roll Mfg. Co. Folder describes the Skydrop unit for hanging seamless backgrounds in commercial, industrial, portrait studios. Complete specifications, prices listed.

ACTIFILM 224
Datagraphic Systems, Inc. 12-page illustrated brochure describes and gives uses for the Actifilm card file system in reducing and filing engineering drawings. Sample is enclosed.

GRAPHIC ARTS

COMET 45 225
Strong Electric Corp. Illustrated brochure describes the Comet 45 completely automatic motor-driven arc printing lamp designed for small reproduction shops and the screen process industry.

THE NEW LOWEL LIGHT PAT. PEND.

IS GOING PLACES— where other lights can't go

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Attaches quickly, simply, safely to wood, plaster, brick, metal, tile, etc. with Lowel-Light Gaffer-Tape.

Offers the finest universal swivel, heat insulated finger grips, high temperature cord and socket, sturdy aluminum construction.

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New notch-and-chain device clamps instantly to hundreds of objects.

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1 unit with Gaffer-Tape . . . $6.95
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15 yds. Gaffer-Tape 2" wide . . . $1.95

LOWEL-LIGHT PHOTO ENGINEERING, DEPT. C
421 WEST 54th STREET, NEW YORK 19, N. Y.

Get more information. Circle 481, page 87

Berkey brings you COLOR PRINTS AT PRACTICALLY THE COST OF BLACK 'N WHITE!

You shoot in Kodacolor or Ektacolor . . . and leave the rest to BERKEY.

We relieve you of all production headaches . . . do all your processing to produce superb quality color prints at practically black-and-white cost to you!

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For full details of the BERKEYCOLOR plan and information on obtaining our services on a franchise basis, please write to

BERKEYCOLOR 77 East 13th Street New York 3, N. Y.

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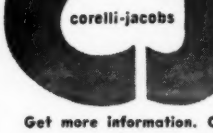
corelli-jacobs **FILM MUSIC ON DISC - TAPE**



Corelli-Jacobs Film Music Inc.
723 Seventh Avenue
New York 19

Get more information. Circle 419, page 87

ARC PRINTING LAMP 226
Strong Electric Corp. Brochure describes the Tri-Power Arc Printing Lamp which burns three carbons to produce powerful single light source, cut plate exposure time.

OVERHEAD CAMERAS 227
W. A. Brown Mfg. Co. 4-page illustrated folder includes specifications of, space requirements for the Admiral overhead process camera, available in 31, 41-in. models.

KLIMSCH PROCESS CAMERAS 228
Repro Graphic Machines, Inc. Illustrated brochure describes the Klimsch Super Autohorika 101 horizontal process camera in sizes from 24x24 to 40x40-in. Complete specifications on optical, technical data.

PHOTOMECHANICAL EQUIPMENT 229
The Douthitt Corp. 12-page catalog and two supplementary price lists for graphic arts equipment includes printing frames, flashing lamps, stripping tables, etc.

PHOTOMECHANICAL EQUIPMENT 230
W. A. Brown Mfg. Co. 10-page illustrated catalog describes photomechanical equipment. Includes complete specifications.

STRIPPING
Eastman Kodak. Revised pamphlet, *Stripping to Estar Film Instead of Glass*, supersedes older pamphlet (Q-102) which recommended *Stripping to P.B. Film Instead of Glass*. Request Pamphlet Q-106 from Graphic Reproduction Sales Division, Eastman Kodak, Rochester 4, N. Y.

MAGENTA CONTACT SCREEN
Eastman Kodak. Revised pamphlet, *How to Use the Kodak Magenta Contact Screen*, includes latest information on application of screen in making halftone negatives, positives for photomechanical reproductions. Request Pamphlet No. Q-21 from Graphic Reproduction Sales Division, Eastman Kodak, Rochester 4, N. Y.

PHOTOCOPIER 233
Cormac Photocopy Corp. Illustrated brochure describes Cormac's new '300' photocopier with Flo-Tronic Control for automatic electronic operation.

DIAZO FILM 234
Robert J. Brady Co. Specification sheet gives the particulars on Visichrome diazo film which is available in rolls, sheets.

VERTICAL CAMERA 235
Robertson Photo-Mechanix. 4-page brochure includes specifications of the Econo-Mite camera for producing line and halftone negatives, xerography, Ektalith method or diffusion transfer plates.

WASHABLE TRACINGS 236
Keuffel & Esser Co. 4-page brochure includes specifications of Herculene Drafting film, sample sheet and special pencil for tracings which can be cleaned by washing.

ANKEN 27 PROCESSOR 237
Anken Film Co. 4-page folder describes the Anken 27 silver emulsion processor for engineering, reproduction departments. Handles papers, films, up to 27 in. wide. Operating specifications.

(*continued on page 86*)

Carr Color Processing Units

QUALITY AT COMPETITIVE PRICES!

★ ALL SIZES AVAILABLE TO MEET YOUR PRODUCTION NEEDS
★ TYPE 316 STAINLESS STEEL USED THROUGHOUT
★ ENTIRE FIXTURE IS HIGH POLISH CHROME & STAINLESS STEEL
★ WORKMANSHIP IS THE FINEST ATTAINABLE; NO SHARP EDGES
★ EVERY WELD PASSIVATED & GROUND; ALL CORNERS RADIUSED
★ DESIGNED PROPERLY FOR LONG LIFE USE

Illustrated above is one of a complete line of processors, sinks, tanks, mixers, and similar equipment. Call on our 15 years of production experience in this field to fill your requirements. You are assured of the best in trouble free operation when you buy Carr. Custom fabrication to your specs is where we excel.

Send for our catalogs: Photographic Darkroom Equipment, Color Processing Units, Graphic Arts Processors, or X-RAy Processors. Please specify.

CARR CORP., 1101 Colorado Ave., Santa Monica, Calif., UPton 0-9237

Get more information. Circle 424, page 87

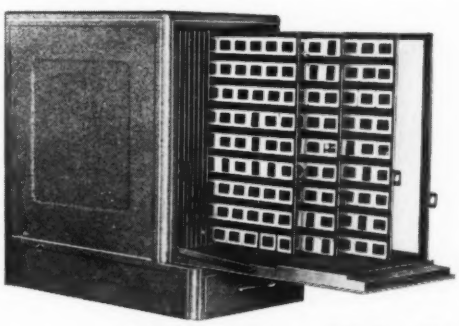


PHOTO SLIDE FILING SYSTEM

With Every Slide Cross-indexed For Quick Visual Reference and Use

When you keep your slides in this Multiplex cabinet, you gain these three advantages:

1. Orderly classification—by subject matter, date, etc. Cross index cards available.
2. Convenience—slides can be viewed against light-diffusing panel—individual slides easily inserted or removed.
3. Protection—against loss or damage—with slides properly stored—cylinder-type key lock on door.

The Multiplex Slide Cabinet shown above holds 2340 slides, 2" x 2" . . . or 780 slides, 4" x 3¼" . . . or some of each. Door opens down to provide shelf. Spacious utility drawer in base. Smaller and larger sizes, and other models, are available. For more complete information, use the coupon below.

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DISPLAY FIXTURE CO.
931-941 North 10th St.,
St. Louis 1, Mo.

Please send me Slide Cabinet Bulletin LS-158
NAME .....
FIRM .....
ADDRESS .....
CITY & STATE 060

Get more information. Circle 488, page 87

FREE LITERATURE

(*continued from page 85*)

COLOR PRINTS
Eastman Kodak. 20-page pamphlet, *Three-Color Separation Prints From Color Negatives With Kodak Resisto Rapid Pan Paper,* gives step-by-step instructions on production of both separation prints and masks. Request Pamphlet E-47 from Sales Service Division, Eastman Kodak Co., Rochester 4, N. Y.

ADD-O-SOL 239
Philip A. Hunt Co. 8-page booklet introduces Add-O-Sol, new filming agent for powderless etching of zinc. Formulations, etching procedures, replenishment rates, zinc plate brands tested with the new agent are listed.

MOTION PICTURES

PRE-PRINT PREPARATION 240
Byron Motion Pictures, Inc. 4-page recommendations of the Association of Cinema Laboratories, Inc. available on each of the following: *Preparation of Original 16mm A&B Rolls, Preparation of 16mm Printing Leaders, Method of Marking Work Prints to Indicate Effects.*

SPLICING & INSPECTION 241
Kidde Machine Corp. Illustrated brochure describes the Kidde Mark IV film inspection and automatic splicing machine for motion picture film.

GORDON NEWSLETTER 242
Gordon Enterprises. 4-page newsletter *News and Views* includes information on the Magnasynce Nomad 2-channel recorder-reproducer, for lip-synch sound recording. Also has information on rental equipment and instrumentation information.

LOWEL LIGHT 243
Lowel Light Photo Engineering. 4-page reprint from American Cinematographer Magazine entitled *A Light Unit that Mounts Anywhere.*

EDITING 244
Prescision Laboratories, 8-page illustrated booklet describes Precision's film editing and laboratory equipment. Includes complete specifications, some prices.

FILMSTRIP PRODUCTION 245
Manhattan Color Laboratory, Inc. Brochure gives prices, describes services of this specialist in filmstrip production, 35mm and stereo slides. Sample filmstrip for projection.

SERVICES

MOTION PICTURE PRODUCTION 248
Videart Inc. Brochure describes services offered including animation, optical photography, art staff.

FILM LIBRARY 250
Sherman Grinberg Film Libraries, Inc. Brochure outlines a few of the 2,000 features that are available from this firm.

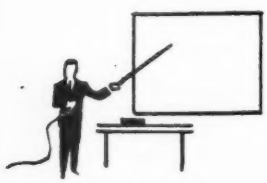
MEISEL PRICE LIST 249
Meisel Photochrome Corp. 9 catalog sheets in folder includes complete prices and information regarding the positive and negative color services offered by this Dallas, Texas firm.

COLOR MOVIE LAB
General Film Laboratories. 16-page pamphlet describes the color motion picture services offered by this lab. Send requests on company letterhead to General Film Laboratories, 1546 Argyle, Hollywood, Calif.

SOUND STUDIOS 246
Fine Recording, Inc. 8-page illustrated brochure describes complete sound studios, film, mastering, pressing, packaging facilities of this New York company. Prices given.

MOTION PICTURE PRODUCTION 247
General Film Laboratories. Newsletter, *Rewind,* punched for 3-ring notebook, offering much practical information on film production services, problems. Calendar of forthcoming A-V events.

MOTION PICTURE, TV
National Cine Equipment, Inc. 20-page illustrated price list of sound, lighting, cutting room equipment, cameras, dollies, blimps, lenses for rent for 16, 35mm motion picture, television work. Maintenance, repair services also offered. Available only by request on office letterhead addressed to National Cine Equipment, Inc., 209 W. 48 St., New York, N. Y.



Four million slide changes and still going strong—this unheard of operation without servicing. This simply stated, is YOUR assurance of RELIABILITY and FAULTLESS OPERATION. Models available for reversible—1200-watt lamps—16 or 48 or 96 slides—Film strip accessory also available.

The SELECTROSLIDE may be used in the office, or the smallest class room or in the largest auditorium, synchronized with tape recorders for either one-time or continuous lectures, advertising or sales presentations. Write today for illustrated literature and name of nearest dealer.

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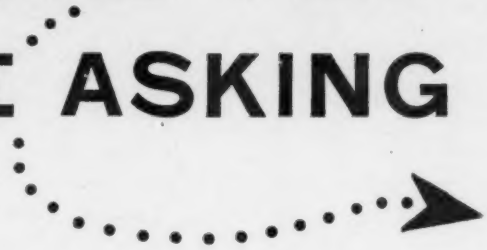
MANUFACTURERS OF SELECTROSLIDE CONTINUOUS AUTOMATIC SLIDE PROJECTORS
"Merit Award Winner" at the Brussels World's Fair.
Get more information. Circle 523, page 87

YOURS FOR THE ASKING



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NEW PRODUCTS

For additional information on any new product circle the appropriate number on the readers' service card, page 87.

ROLL RULER 101
A handy ruler called the Par-A-Glide roll ruler is said to speed up ruling of columnar paper, graphs etc. It consists of a transparent ruler with a built-in roller. Parallel lines can be drawn without lifting the ruler from the paper. A calibrated scale makes exact spacing of lines quick and easy, it is claimed by the distributor, Calmart International. Price: $3.95.

STOP-LITE 102
A miniature lamp assembly for illuminating the stop-openings of enlarger lenses has been introduced by Lester Hehn Engineering. Operating on 110-120V AC the lamp has an operating life of over 25,000 hours, it is said. Price: $2.95.

MICROFILM READER 103
A new, lightweight, microfilm reader, the Recordak 310, has been announced by the Recordak Corp. The unit weighs 23 pounds, and is less than 20 inches high. The viewing screen measures 9x12 in. and is tinted a "soft green." It will accommodate 16mm unperforated microfilm in 100 foot lengths. Reduction ratios available are 20:1, 24:1, 32:1 or 40:1.

PORTABLE AIRBRUSH 104
A portable airbrush and canned power supply, called Wren-Pak, has been introduced by Binks Manufacturing Co. The pressurized can is said to permit 30 minutes of intermittent spraying. A single hose connects the can to the air brush. A feature of the airbrush is the fact that it carries its own material or paint supply in an attached bottle. Spray pattern is adjustable from round to fan.

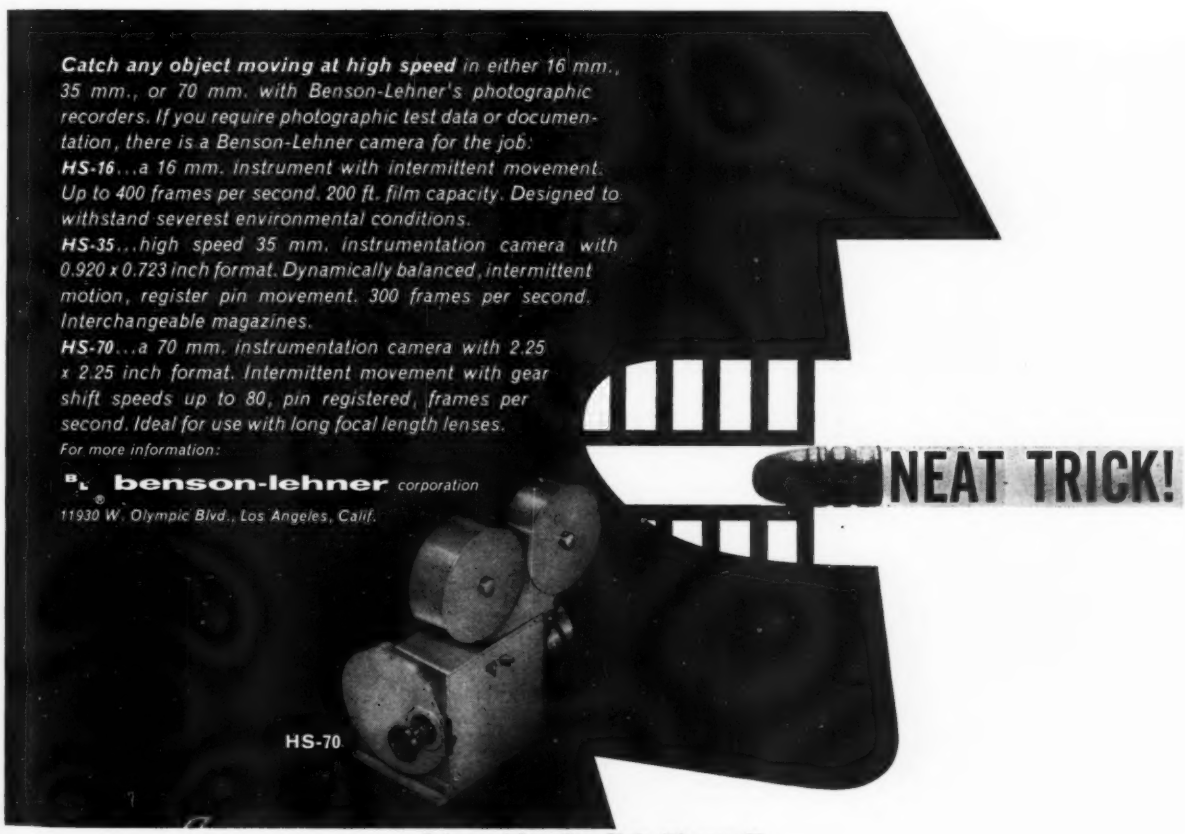
FILM PROCESSING BASKET 105
The Dandy Dunker is a plexiglass film processing basket whose walls are slotted vertically for direct loading of sheet film. The basket, manufactured by Tomorrow, Inc., can accommodate 50 sheets of film in either 5x7 (Model 'A') or 4x5 (Model 'B') format. These two models are designed for a 3½ gal. tank. The smaller Model 'C' fits the Kodak 5x7 tank and accepts either 12 5x7 sheets, or 20 4x5 sheets.

The manufacturer claims that the unit eliminates the need for unloading and reloading when processing color transparencies since re-exposure may be done safely with up to 50 sheets simultaneously.

SOUND SLIDEFILM PROJECTOR 106
The DuKane Corp. introduces the 1961 model of the "Micromatic" sound slidefilm projector. This fully automatic projector incorporates a 35mm film-strip projector and record player which automatically synchronizes projected pictures with narration and sound effects. In addition to improvements in the lamp housing cover and tone arm, the Micromatic features picture changes triggered by sound waves. Inaudible impulses of 30-50 cycles cut into records activate picture changes automatically without annoying beeps or bells. Price is $230.

ELECTRIC LOCKING UNIT 107
A safety electric locking unit for light or air traps in photo darkrooms, introduced by Challenger Lock Co., operates on a 24-volt AC current. The device utilizes a nylon bolt which is released by remote actuation, locking the door. When reactuated, the bolt returns to the latch permitting the door to be opened.

MILLIKEN CAMERA HOUSING 108
A protective housing for Milliken cameras is available in two sizes. The housings are designed to protect the 16mm high speed cameras from heat (up to 1000°F), water, and dust. Splashproof construction permits water spray from any direction and silicon gaskets seal all openings. The K-30-1 housing will accommodate the DBM 3, 4, or 5 camera. Model K-30-2 will accommodate the DBM 4 with 400-ft. magazine as well as DBM 3, 4 or 5.


Catch any object moving at high speed in either 16 mm., 35 mm., or 70 mm. with Benson-Lehner's photographic recorders. If you require photographic test data or documentation, there is a Benson-Lehner camera for the job:
HS-16...a 16 mm. instrument with intermittent movement. Up to 400 frames per second. 200 ft. film capacity. Designed to withstand severest environmental conditions.
HS-35...high speed 35 mm. instrumentation camera with 0.920 x 0.723 inch format. Dynamically balanced, intermittent motion, register pin movement. 300 frames per second. Interchangeable magazines.
HS-70...a 70 mm. instrumentation camera with 2.25 x 2.25 inch format. Intermittent movement with gear shift speeds up to 80, pin registered, frames per second. Ideal for use with long focal length lenses.
For more information:
benson-lehner corporation
11930 W. Olympic Blvd., Los Angeles, Calif.
NEAT TRICK!
HS-70
Get more information. Circle 409, page 87

COLORTRAN CONVERTER 109

Kenro Graphics' 'Vertical 24' camera incorporates a ColorTran converter as standard equipment, providing for both normal and high intensity light levels. The unit, equipped with a prismatic head becomes an opaque projector, or make-up machine, and will photocopy full-size newspaper pages, or other matter up to 18 x 24 in. The ColorTran converter, according to the manufacturer, makes possible the highest intensity and color temperature possible, permitting very short exposures without overloading the long-life lamps.

OPTICAL SHUTTER 110

Electro-Optical Instruments has introduced a new line of hermetically sealed Kerr Cell Electro-Optical shutters capable of operating in the 1/100 millionth sec. range, according to the manufacturer. The Kerr cell is composed of two flat plates or electrodes immersed in a fluid which becomes birefringent upon the application of an electric field. When such a cell is oriented between two polarizers crossed for minimum transmission, the arrangement constitutes an optical shutter. With no voltage applied to the cell, light cannot be transmitted because of the crossed polarizers. A voltage, in the order of 35kv, applied to the electrodes has the effect of altering the state of polarization of the light, and transmission through the second polarizer is accomplished. Since no mechanical motion is involved, shutter speeds in the Nanosecond (10^{-9}) time domain are feasible. Suitable pulse forming networks, modulator, and power supply are used with the Kerr Cell.

3-D TITLE LETTERS 111

When a pressure sensitive adhesive is coated on the back of the new 3-D Hernard Title Letters, these letters can be applied to any non-absorbent background and the titling accomplished at the time the movie, or still photo, is taken. The letters are precision molded of a white plastic ceramic material and have a full ¼-in. depth of relief. Sets are packed in a Lucite case, and come in two sizes: ⅜-in. Copperplate style, and ¾-in. Gothic Condensed style. Price: $4.95.

SILVER RECOVERY UNIT 112

The Rotex 'Silver Lode' silver and hypo recovery unit designed for the smaller X-ray and photographic plants is a self-contained unit for 110V outlet with full wave rectifier and an acid resistant circulating pump. The 'Silver Lode' is contained in an aluminum cabinet 12 in. wide, 15 in. long and 21 in. high. Hypo is pumped from the tank to the recovery unit with gravity return. The manufacturer claims that no interruption or delay is necessary in the normal developing processes while the silver is recovered and the hypo life prolonged. Price: $395.

POLAROID TEN-SECOND FILM 113

A new 10-second time for a finished print has been announced for its Type 47 (3000-speed) film by the Polaroid Corp. The new film, in addition to its greatly reduced developing time, has 50 to 100 per cent greater resolving power to produce higher quality photographs, according to Polaroid. Although Type 47 is the only film that has been converted to the 10-second speed at the present time, conversion of Polaroid's other film types will take place during the next few months. Retail prices will remain the same. The 10-second picture roll can be distinguished by the instruction sheet and film wrapper inside its box and by a small star printed near the date stamp on the bottom of the box. The new film is available now.

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Packaged in aerosol containers, the new Faymus type and platen cleaner is said to be non-toxic, non-flammable and non-corrosive. The cleaner contains no carbon tetrachloride. Price: $1.29 for 6 oz. can.

X-RAY MOVIES 125

Photomechanisms Inc., recently announced their Model 225 Camera for X-ray motion pictures of human organs and functions. Minimum hazard to the patient from exposure overdosage has been achieved according to the manufacturer, by means of a device which limits X-ray exposure only to the periods of frame sequence. Frame speeds at rates of 7½, 15, 30 and 60 per sec. are available. The camera utilizes a 100-ft. Kodak Cine Special magazine which is coupled to a polarized synchronous motor drive. The drive train includes a commutator which furnishes shutter phasing information, while a selector switch provides frame rate information. This design is said to cause phasing between the 60-cycle power line and the camera shutter to be maintained accurately for all frame rates.

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All prices include Federal Excise Tax where applicable.

Get more information. Circle 496, page 87

PHOTO BOOKS IN REVIEW

THE ABC'S OF CAMERA REPAIR, *Samuel Love, The National Camera Repair School, Englewood, Colo. 1959, 84 pages.*
The title of this soft cover tome is an unfortunate choice. While the contents of the book are hard to fault—the name of the book is bound to lead one astray. It does not tell the reader how to repair cameras; instead, *The ABC's of Camera Repair* is the most complete and one of the most concise glossaries of camera and photographic terms we've seen.

Mr. Love launches into his subject with A (for auf, the open position on some German camera latches) and marches in neat alphabetical order through Z (for zeit, the German indication for "time" on a shutter or zu, the closed position on some German camera latches). Along the way are definitions for the argot of applied physics, chemistry, mechanics and art of picture making and camera work. Mr. Love follows for the most part the good lexicographer's rule of defining (or explaining) each term with simpler terms. In sticking to this principle, he'd make any scientist quiver—but for the rest of us, he explains things good.

OFFICIAL 35MM CAMERA RATING GUIDE *Herbert Keppler, Universal Photo Books, New York. 128 pages. $1.95*
This second edition of what now is a standard work brings a welcome touch of sanity to a mad camera market. With new models announced practically every day, choosing a suitable 35mm camera is becoming quite a chore. The book consists of two unequal parts, a small "how to buy" chapter and a huge directory with critical comments. A close perusal of both is recommended before walking into any camera store. And if everyone in the plant comes to you for advice, don't talk; just slip them a copy of this book and let them think for themselves. —HM

KODAK MATERIALS FOR AERIAL PHOTOGRAPHY, *Eastman Kodak Data Book, Eastman Kodak Co., Rochester, N. Y. 1959, 42 pages, 50¢.*
By now Kodak Data Books need no introduction and certainly little criticism. Very nearly the ideal in technical material, they are concise, well-written and authoritative. This one, a revised edition, is all of that. If you use aerial photography and need data on which materials to use, this is your book. And if you don't normally use aerial photography but somehow find yourself on a plane, keep this book in your gadget bag for a quick course before pressing that button.

(*continued on page* 92)

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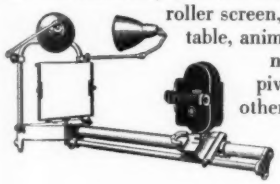

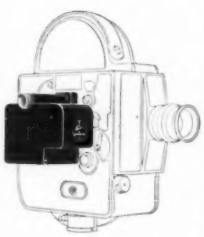

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BOOK REVIEWS

(*continued from page* 91)

THE MAGIC OF MAKING HALFTONES, *K. W. Beattie, Litho Books, Caldwell, N. J., 1959, 95 pages, $4.25.* This is a practical, down-to-earth treatment on how to make halftones with glass screens, contact screens and Autoscreen film. Simple but effective control in exposure and processing by means of a five-step grey scale is not only thoroughly covered in the text but profusely illustrated with "right" and "wrong" pictures.

Considerable attention is given the variables of copy, camera, lights, processing, etc. The author describes any number of helpful gadgets, techniques and shortcuts. How to rescreen halftone copy, make dropout masks, fine-line pickups and related items are also discussed. While not intended to be a technical treatment of the subject it is nevertheless based on sound and proven technical principles. The author's knack for simplifying the technical will prove especially appealing to the novice. —H. P. PASCHEL

INTERNATIONAL PHOTOS, VOLUME 2. *Munich 1959, 200 pages. 100 full page illustrations, Grossbild Technik, $10.*

This second volume devoted to "large format" (read Linhof) photography is every bit as big and beautiful as its predecessor. In fact, it might be considered a triumph of the printer's art over that of the photographer's, since the pictures are not nearly as outstanding as the production. Many of them appeared in *Grossbild Technik* so they are not new. If they hadn't, they still would not have been new, being the type of slick, planned, professional work which displays the photographer's technical virtuosity. It is like a master chef who mixes the same ingredients over and over again until he has a perfect mix and sticks to it.

16MM TERMS USED IN PRODUCTION OF NON-THEATRICAL MOTION PICTURES *Journal of the University Film Producers Association,* Vol. 12, No. 2, Winter, 1960. According to a covering letter this 34-page publication is "an up-to-date" glossary of more than 600 key terms and definitions as used in 16mm motion picture production, developed through the cooperation of the American Standards Association, the Academy of Motion Picture Arts and Sciences, the Theatre-Arts Department of the Uni-

(*continued on page* 101)

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THE FILM REPORT

(*continued from page 45*)

success in showing the upper-atmosphere action of missiles through the use of models, rather than animation. In the movie version of "Echo", for example, models were used to show the separation of the final stage, the spin-out of the ball and the chemical inflation of the huge balloon.

Scott, who has been in the motion picture business as writer, actor, director and producer for 24 years, looks on the burgeoning use of motion pictures as a revolution in communications. "At times," he says, "the techniques of producing a convincing movie about a missile are not far removed from the techniques of keeping an audience on the edge of its chair as the villain moves in for the kill, à la Hollywood. But technical films are not entertainment."

Scott repeated one commentator's statement that half of the defense budget is spent for words: orientation, reports, discussions, telegrams, preparation for congressional briefings, and so on. If pictures do, indeed, displace a large quantity of verbiage, then movies are destined to become the most efficient means of communication.

They are quicker, more effective, and produce a bigger return per time unit per dollar than any other media, in Scott's opinion.

If he has any advice for would-be space-age movie makers, Scott says it would be to do only what is necessary to get the message across. He deplores the aim for awards via "artv" pictures which sacrifice the basic purpose.

Time, he points out, is of the essence in today's race for space. The film maker's responsibility is to tell the story the best way possible to create a maximum degree of understanding. Documentary films are not intended to stimulate emotion (not directly, at least) but simply to transmit data. This reduces the industrial motion picture to its barest essential—pure and uncomplicated communication between manufacturer and viewer.

Technically, industrial in-plant photographic services are doing an excellent job, according to government experts charged with administering their product. There are no serious flaws in their handling of emulsions, choice of film or application thereof.

The USAF's Major Stokes does caution film makers against the indiscriminate use of color. If an exercise has been fully documented in color

(*continued on page 94*)

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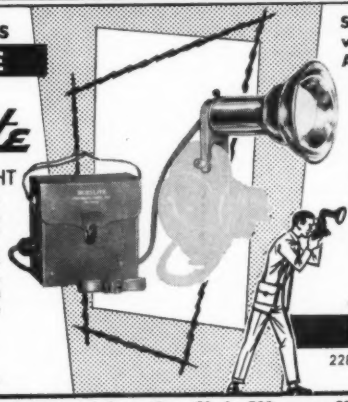

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THE FILM REPORT

(*continued from page* 93)

and phase two is set for launch, the industrial cinematographer may well consider photographing the action in black-and-white if color would serve no useful purpose.

Chief among Stokes' admonishments for industry is his plea for cooperation and dispatch. A missile maker who sits on films of a project and turns over to the USAF's film lab master copies a year later is doing himself as well as the nation a disservice. At Wright Field, the USAF library is available to all bona fide agencies dealing with the motion picture medium. An industrial unit which does not copy and release masters promptly only slows the space effort. Stokes would like to see manufacturers turn over films within a month of a project's completion.

Stokes' second point is to practice economy. Industrial motion picture producers who fill a warehouse with superfluous films create work for the government aides who must sort and file them. If this film is classified, the chore is even more burdensome, since such films cannot simply be thrown in the wastebasket. Stokes would like to see film makers submit only films that are pertinent to the issues, not useless miles of unnecessary duplication.

As the space effort progresses, motion pictures will be relied on more and more, Stokes feels. For example, the projected orbiting of a human being can be planned in advance by orbiting motion picture cameras to photograph ascent and reentry. Such films can be used to simulate space flight on earth when the astronauts undergo preliminary "wind-tunneling" in and out of orbit on the ground. Stokes sees a mounting demand for documentary motion pictures as the race for space continues.

Stokes' counterpart at NASA, Byron Morgan, anticipates a growing need for films depicting America's space effort slanted for viewing by the American people. His chief criticism now is that the resources of the space agency are too restricted to properly handle the job. It's the old story of not enough people and not enough space. But the agency is young, and as it grows its use of movies will undoubtedly flourish.

Morgan has no outstanding bone to pick with industry. His agency's contracts require two films a year on long-term projects, but the giants of the industry provide him with far more than that when the heat is on. Even so, Morgan is doing his best to get an even more rigorous specifica-

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tion written into future contracts.

His biggest problem is not so much with industry as it is with the technical brains NASA must deal with. An engineer, developed by years of textbook training and field experience, finds it difficult to accept a film which merely skims the surface, technically.

Though engineers are hard to convince, scientists are easy, says Morgan. Their vision often encompasses a wider sphere, since they must deal with the "uninitiated" who provide funds for their projects. Therefore they are less immune to the lay outlook than the engineer, whose sole concern is with technical accuracy.

One of NASA's paramount charges is to educate the American public. Films, at NASA, are on a par with the written word. In other countries, where we must deal with masses who cannot read, films are the primary means of communications. In this country, television is the chief vehicle for public dissemination of government-sponsored motion pictures.

One NASA-sponsored film, *Time and Space*, depicting the nation's effort to conquer the atmospheric voids above, drew an audience of millions when it was placed with Modern Talking Pictures for nationwide "free" distribution to television stations, schools, and other public agencies. *Time and Space* was produced for NASA by an independent producer, drawing on the space agency's voluminous film library for background material.

The use of an independent producer may well be the solution to what could be a staggering investment for the small manufacturer. Morgan advises the new company not to get too deeply involved in photographic details until it is firmly established. For a fraction of the cost of setting up an in-plant facility, a company can call on an independent producer and wrap up the contractual commitment in jig time.

Furthermore, the independent lab probably will do a better job. Photographic know-how in the missile race does not come easy. It's not only the cost of facilities that skyrockets the expense of making motion pictures. Union salary agreements can quickly turn a modest production into an expensive one.

It's the NASA viewpoint that the American public is spending an enormous sum for conquest of space. Consequently, the body which furnishes the pocketbook is entitled to know how the money is being used. Nothing can so effectively dramatize the successes and the failures of the space program as the motion picture.

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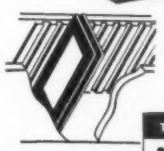

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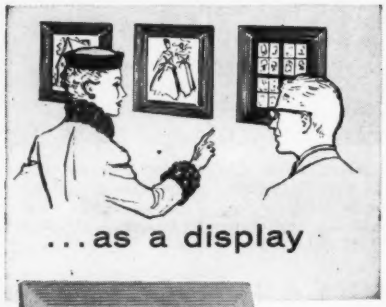

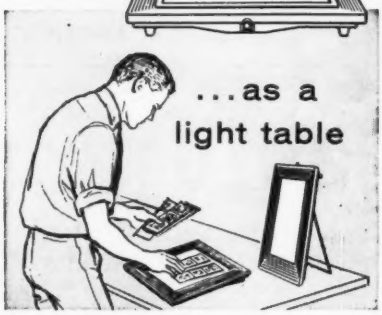

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IN-PLANT TEST

Navy cameraman Henri Silz gives a personal view of the new Kenyon Gyro Stabilizer

Specifications: Kenyon Gyro Stabilizer, KS-4, made by Kenyon Products Inc., Chester Airport, Deep River, Conn. Size 2¾-in. diameter by 4½ in. long. Gyro wheel speed approximately 21,000 rpm within five minutes after applying power. Aluminum alloy construction, hermetically sealed housing. Weight, 34 oz. Estimated life, over 6000 hours of continuous operation. Power source, 115V, 400 cps AC. Requires approximately seven watts. Insulation against voltage breakdown to 500 volt RMS test. Stabilization on longitudinal axis of stabilizer. Recommended for use on heavier handheld cameras and optical instruments. Price, $400; Portable power with charger, $124.50.

Henri Silz, Chief Photographer, United States Navy, Floyd Bennett Field, Brooklyn, New York, reports: The following tests were made with equipment listed below: B & H Eyemo, 35mm, weight 21 lbs.; B & H 70 DL, 16mm, weight 12 lbs.; Arriflex, 16mm, weight 12 lbs.

Test 1. 1130 hours, weather poor, visibility poor. Helicopter HSS-1. Cdr. Brown, pilot; Silz, PHC, photographer. All cameras equipped with normal, wide-angle lenses. Film stock, 100 ft. Superior 2, black-and-white.

Gyro operated perfectly. Definite aid in holding camera steady. Difficulty of holding horizon line straight completely solved. Picture was as steady as ground shot. Vibration, 60 per cent removed at maximum vibration position of aircraft; 100 per cent removed in all normal flight conditions. Main difficulty was awkward holding of camera. Added weight of gyro no effect in flight or when gyro is running. Test completely successful.

Test 2. 1000 hours. Weather good, visibility good. Ground pictures by Novak, PH1. Lenses used: 6-in. and 10-in. Pictures made with handheld camera, 10-in. lens, sharp and steady. No apparent movement or lack of steadiness. Pictures indicate that long lens can be used under emergency conditions. Test successful.

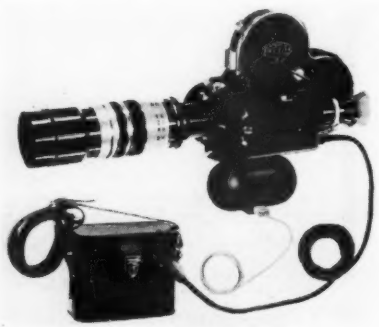
Test 3. 0900 hours. Weather good, visibility good. Ground pictures with normal, wide-angle lens. Test of camera in handheld panning. After initial start of pan, gyro successfully holds camera steady, even. Small uneven buck at beginning of pan.

Test 4. 1000 hours. Weather, visibility good. Aerial photography using 6-in., 12-in. lenses. Aircraft used SNB. Cdr. Brown, pilot; De Angelis, PHC, USNR, photographer. Operation excellent; no difficulty encountered.

Test 5. 1100 hours. Helicopter HSS-1 used, maintained at maximum vibration. Lt. Knight, pilot; Reilly, PHC, photographer. Some difficulty in hand-holding equipment at start, but results very good. Weight and bulk did not handicap operation.

Findings: Under worst possible conditions, stabilizer 70-80 per cent effective. Under routine conditions, 100 per cent effective. Unit recharged after every test. Slight difficulty with weight, bulk of equipment.

Note: This test does not imply any endorsement of this product by the United States Navy. It is the findings and opinions of an individual user and lab operating under the United States Navy, not the Naval Service or the government.



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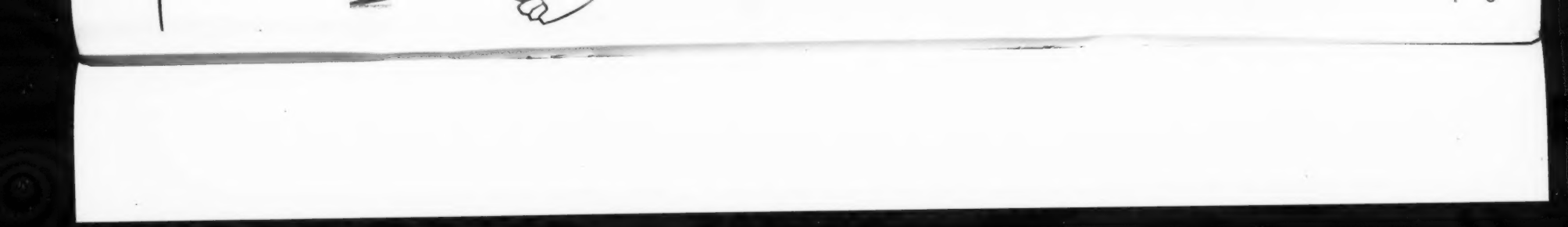

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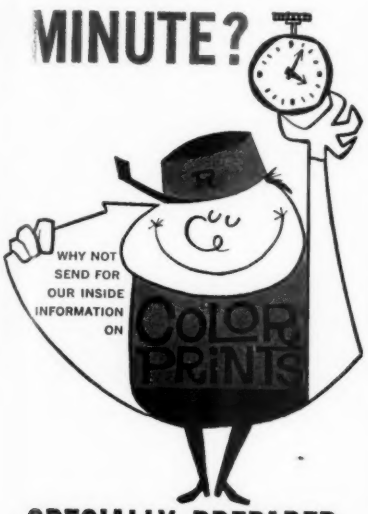

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Get more information. Circle 512, page 87

WEST IS WEST

Until this issue, items For Your Information covering both the eastern and western parts of the country were thrown together, helter skelter as the saying sometimes goes, in one glorious pot. However, it seems that there has been a tremendous increase in photographic activity out yonder, or whatever the west is called from here in the east. Therefore, we are starting a new sub-department of FYI to provide a more complete coverage of people and places western. This is the first edition of *West is West*, a title which doesn't mean anything specifically but which we liked.

We feel that this is a better head than simply writing *Western Notes* and our consciences would not permit something like *Riding the Western Range* or *Roundup*. As of this writing, our title is still a tentative working title. It was stolen, of course, from Rudyard Kipling who used it as one half of the east-west twain that never shall meet. Since westerners are, by nature and tradition, direct and straightforward, we will try to emulate them and proceed pronto with our news.

Ralph Rose, Jr., former motion picture supervisor at North American Aviation, Columbus, Ohio, division, is the new head of Stanley Aviation's new "Department of Communication." The department will cover audio/visual and publications. Rose assumed his duties with the Denver, Colo. firm October 1.

Edgerton, Germeshausen and Grier, the high-speed people from Boston, are establishing an Advanced Research Department headed by Dr. Raymond O'Rourke. The new group which will spend much of its time at EG&G facilities in Las Vegas and Santa Barbara, will cover the fields of airborne, ground-based and underwater instrumentation, systems engineering, scientific photography and project management. Other members of the group include Clyde Dobbie, a specialist in the field of instrumentation; Donald Hansen, whose field is optics; and Marion Shuler, Jr., whose work covers nuclear instrumentation and reactor technology. Dr. O'Rourke is a physicist.

(*continued on page* 98)

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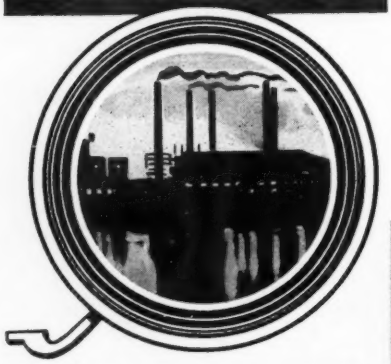

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WEST IS WEST

(*continued from page* 97)

Let 'em eat crow department

In the course of editing and printing Ernest Reshovsky's column on photo instrumentation in the August 1960 PMI, Nortronics, the firm directly involved with all the scientific derring-do, was shifted from being a division of Northrup to the corporate family of North American Aviation. It was an inexcusable error but at least it settles the question of whether or not editors are human. Who but a human could make such a silly mistake? To both firms who saw their organizational chart disrupted, to the bewildered Nortronics who saw themselves being orphaned, to Ernest Reshovsky who saw a well-earned reputation for veracity stained, and to our readers who deserve the best we can do, we extend humble apologies. For the record, Nortronics is a Division of Northrup Corporation and will stay there.

Honors, awards and stuff

The Society of Motion Picture and Television Engineers, known to its friends as simply SMPTE, is raising 14 of its members to Fellow Membership status. The new Fellows are:

Robert Rheinbeck, CBS News, New York City; Sigmund Jacobs, Naval Ordnance Laboratory, White Oak, Silver Spring, Md.; Edward P. Ancona, Jr., NBC, Burbank, Cal.; George Higgins, Eastman Kodak Company Research Laboratories, Rochester, New York; Fred Scobey, General Film Laboratories, Hollywood, Cal.; Eldon Moyer, Eastman Kodak Company, Rochester; Morton Sultanoff, Ballistic Research Laboratories, Aberdeen Proving Ground, Md.; John R. Turner, Eastman Kodak Company, Rochester; Richard O'Brien, CBS Television, New York City; Neal Keehn, General Film Laboratories, Kansas City, Mo.; Hubert Schardin, German-French Research Institute, St. Louis, France; Jerome Diebold, Wilding, Inc., Chicago; Richard Putnam, General Electric Company, Syracuse, New York; Charles Wyckoff, Edgerton, Germeshausen and Grier, Needham, Mass.

Dr. Schardin, incidentally, is receiving a second honor, the E. I. duPont Award. Established this year, the duPont Award will go to that individual named by SMPTE as having contributed, in an outstanding way, to the development of technique and equipment in high-speed photography and instrumentation.

Did you ever wonder who writes those articles you read in encyclopedias? Well, we have it on good

authority (Eastman Kodak, to be exact) that Dr. Walter Clark, head of the applied photography division of the Kodak Research Laboratories at Rochester, is author of an article, 14,000 words long, in McGraw Hill's new (or as we say press-wise, upcoming) *Encyclopedia of Science and Technology*. This is not a maiden effort as far as encyclopedias go: in 1947, he revised the article on photography for the Britannica.

We aren't sure of the relationship between the learned article mentioned above and the current item unless it be classified as a little acorn from which oaks, etc. and etc. Kodak has one of those excellent (and free) Handbook-Notebook articles on *How to Make and Use a Pinhole Camera*. Just write their Sales Service Division, Rochester 4, New York and ask for Kodak Pamphlet T-38. As an editorial aside, we wish that other manufacturers would lower the competitive barriers enough to supply their literature in sizes and punches to fit the Kodak Notebook system. (Actually, Leitz did that for a short time with their *Leica Binder*). This Kodak system is perhaps the greatest advance in photographic literature since the first patent was published in 1839.

Before we close for the month, we would like to repeat an earlier request for information on activities, both personal and organizational, in the photographic field. FYI is your column, where you can get news of interest to the profession printed at no fee at all. Just send items to FYI, PMI, 33 West 60th Street, New York 23, N. Y. Allow about two months for publication and then sit back to enjoy seeing your name in print.

One of the most useful books to come our way in a long time is *Control Techniques in Film Processing*, prepared by a special subcommittee of the Society of Motion Picture and Television Engineers. Chairman of the committee was Walter Kisner, Editorial and Service Engineer, Eastman Kodak Company, Rochester. West coasters on the committee included Harry Brueggemann of Triden Optics, Hollywood, California; John G. Frayne, Consolidated Electrodynamics, Hollywood; William Gephart, General Film Laboratories, Hollywood; Robert Grubel, Consolidated Film Industries, Hollywood; Jack Hall, General Film Laboratories, Hollywood; Frank P. Herrnfeld, Frank Herrnfeld Engineering Corp., Culver City; Edward Reichard, Consolidated Film Industries; Roderick Ryan, Motion Picture Department of Eastman Kodak, Hollywood; Vaughn Shaner, Eastman Kodak, Hollywood; Sidney Solow, Consolidated Film Industries.

A complete treatise on motion picture laboratory practice, this book includes General Aspects of Film Processing to the Economic Considerations in Establishing a Process Control System. Although this book is designed for the movie processor, many of the processes involved and the techniques used can be applied to the larger in-plant sections where quantity processing must be done without sacrifice of quality.

For the photographer who is interested in the theoretical aspects of processing problems, there is an admirable discussion of sensitometry, that much misunderstood and maligned study. In addition, the section on the chemistry of processing is at the same time concise and complete. It strikes a perfect middle ground between the basic text which tells you what to do and the very advanced text which tells so much of why and how something happens that the reader often loses track of what is going on.—THE END

HOW TO SUBMIT MANUSCRIPTS

We're often asked if we buy material from readers. Sure we do; everybody does. PMI welcomes, and pays on acceptance for articles of interest and benefit to photographers in commerce, industry, education and government. If you do a short piece, say on how to ding up a pre-war Speed Graphic to make streak pictures we'd appreciate seeing the complete story. If your idea is of wider scope, we'd rather see a one paragraph summary first. Manuscripts and queries are acknowledged on receipt by post card; we try to give decisions as quickly as possible on whether we'll buy your material. Unused material is returned *if* you enclose a stamped, self-addressed envelope. Contacts or 8 x 10's are best for pictures. Written material should be typed. Rock-bottom price for a short or pic and caption is $5. We often do better.

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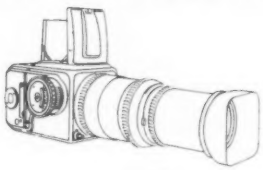

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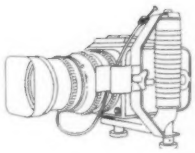

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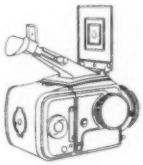

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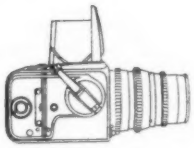

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Some are teachers, some are working photographers, some are professional consultants—but all are familiar with the day-to-day problems of turning out photographs and photomechanical reproduction. To a man, they are eager to help the man behind the camera with problems of a technical or organizational nature. To facilitate contact between you and them, we've provided the form below.

If you have a problem state it here and send it in. PMI's experts will do their darndest to come up with the answer. Although we'll make an effort to answer all questions in the magazine or through personal correspondence we cannot guarantee the latter, and in some cases—such as those relating to developmental work that may end up as a patent or where legal issues are involved—no answer can be given. (We ask that queries be signed, but we will print only initials.)

Address your question to an individual or to the staff in general as you see fit. Shoot.

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BOOK REVIEWS

(*continued from page* 92)

versity of California at Los Angeles, and other colleges and universities represented in the University Film Producers Association.

Readers should appreciate the fact that this little dictionary of movie words is a practical one, but at times the style is so practical it hurts. Apply, for example, the definition of "denouement" to the last 2½ acts of *Romeo and Juliet:* "The closing action of a film, following the climax, in which otherwise loose ends may be brought together, explanations made, and the story generally tidied up before the end title appears."

On the other hand, some of the definitions are so obscure, it's hard to see what's behind them: "ART FILM—Usually, and informational film about an artist or group of artists." "FILMIC TIME AND SPACE—The condensation or stretching of actual time and the elimination of actual space by means of cinematographic techniques."

The authors usually follow the good lexicographer's rule of explaining words with simpler words, and avoiding circular definitions. However, readers can name it too easy, and we would submit that much can be done in reconciling simplicity with technical accuracy. Compare the IFPA definition of "f/number" with that of the *Photo-Lab-Index.* IFPA says, "A number expressing the ratio between the focal length of a lens and the diameter of its aperture . . ." *Photo-Lab-Index* has it: "The relative aperture of a lens. It is calculated by dividing the focal length of a lens by its *effective* aperture . . ." (italics ours).

Persons newly immersed in the argot and technicalities of motion pictures scream, often to us, for some sort of explanation of what everyone is talking about. In spite of some of its lapses, this little book should enable them to keep their heads above water. We'll recommend it to all comers.

Single copies are $1; ten copies, $7.50; 50 copies, $.65 each; 100 copies, $50. Orders are accepted at the University Film Producers Association, c/o Motion Picture Division, 1885 Neil Ave., The Ohio State University, Columbus 10, Ohio.

For additional information on any new products or free literature item, circle the appropriate number on the readers' service card attached to page 87.

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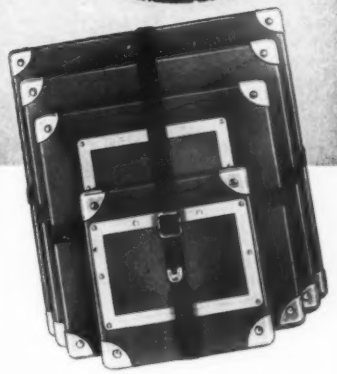

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(*continued from page 35*)

times greater than FGP's.

When testing set-ups of lamps for photographing small areas and using lamps with narrow beams where aiming is critical, use of Polaroid film is very good. Often tests are made against a white card. Another idea and one which is quite cute, is a card coated with a fluorescent material that retains an image for a minute or so after exposure to bright light. Standard luminous paint is fine; Edgerton's lab makes a paint of fine zinc sulfide in a clear lacquer. It has fine retention properties. They also use this for a neat demonstration of high-speed work by hanging a 4 x 6-ft. screen of this material in a semi-dark room with an electronic flash unit aimed at it.

Big shot

A microphone hanging near it triggers the flash. They blow up a balloon, invite spectators to prick balloon with pin in front of screen. The sound triggers the flash and leaves an image of spectator's hand and bursting balloon on screen. By moving the microphone farther away, various stages of balloon collapse appear in silhouette on the screen.

When using Eastman Kodak Focussing Leader (a ground glass like motion picture film stock used for focussing on film plane of cameras like Beckman & Whitley Magnafax) a soft pencil mark on the ground side makes for easier focussing on emulsion. A pencil that is excellent for lab work is a Koh-i-noor 1555 that writes on glass, metal or anything shiny. Is especially good for marking ground glass.

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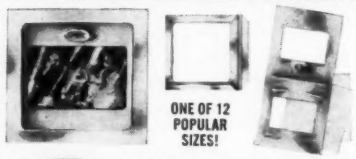

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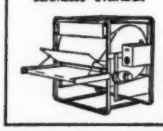

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one end to unit. Although connectors are fine, too frequently someone leaves a cord behind or goes on a job without all the connectors. Good note for designers.

Fred Emons of Wollensak showed a new tripod that Fastax is bringing out. Made by Quickset, its best feature is the head which will fit other kinds of tripods or other professional Quicksets. In addition to normal tips, turns and adjustments, this one has a dove-tail wedged top that *slides* forward or back six inches for use in close-up work. This makes for easier focussing—and for medical work, especially, lets you move quickly in toward subject.

Wollensak also has a new film processor that will handle negative or reversal positive at a rate of 4 ft. per minute. Small enough to be taken to jobs when rush proofs are required.

When setting up a view camera for a critical picture where focus is very shallow, and camera alignment is precise, you can avoid shaking the camera in putting holders in by taking back off the camera, inserting holder, and then putting back onto camera again and pulling slide. The vibration of removing a back by lifting the spring pins is much less than when holders are jiggled and wiggled into place. Good trick for photomicrographs, too.

All of these tricks go to make for easier, better, less frustrating photography.

Having worked in this field for many years and having a keen awareness of the complications of instrument adjustment and complexity, I've come to the conclusion that often the most successful high-speed photographer is one who takes his time.—THE END

FARBER AT M.I.T.

(*continued from page* 34)

tend to seconds. Likewise, deionization time can be extended by temperature rise to the point where the flash does not even extinguish.

The two critical problems are as much influenced by the circuit and how it is used as by the nature of the flash tube itself.

Since it is just twenty years since electronic flash moved from the research labs to the studio and shop, the meeting provided a searching review of the state of the art, supplied everyone with more new projects than they knew what to do with, and left everyone hoping that there will be another such meeting soon.

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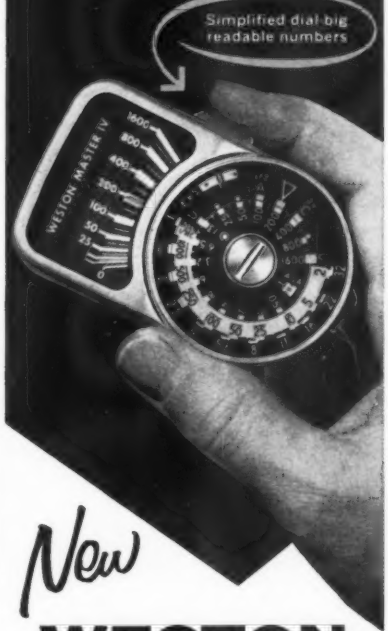

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(*continued from page 22*)

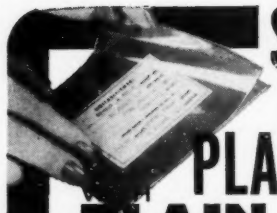
film. For instance, the seminar saw the outtakes for the drilling sequence (which I consider one of the finest sequences in industrial film footage). We saw some beautiful shots of drilling that took Flaherty more than four weeks to shoot. Then he decided to discard it all. It had all been shot in daylight; and it failed to satisfy him. He decided to reshoot the whole thing at night. And the night shots had exactly what he was looking for, the mystery and the magic. They also eliminated the cluttered background of a drilling floor. Thus he was able to delineate more sharply the incredible skill and precision with which the roughnecks work on a breathtakingly dangerous job.

His non-preconception led him to institute many innovations. When he was shooting *Moana* on a South Sea island, he found his color blind film extremely inadequate for reproducing the beautiful landscape of the paradise. He had with him some film for a new tri-color process which had failed to work. He decided to use the film from this process as black-and-white. He became the first man to use panchromatic film for a movie.

In 1946, Irving Browning, of Camera Mart, showed Flaherty a "crazy" camera developed by the Germans for filming under battle conditions. He grabbed it instantly as the most practical camera for his *Louisiana Story,* and thereby became the first to use the Arriflex for a feature film.

Seminar films

The discussion of the Flaherty tradition played only a small part of the seminar. A dozen film makers, sponsors and film experts showed and discussed more than 85 films in ten days. The categories ranged from a thirty second abstract animation by Robert Breer to a 1½ hour feature film entitled *Apu.* This was made in India by Satyajit Ray, and it is the last of a trilogy which won unanimous critical acclaim. We saw a number of films from Canada, where many young film makers develop and flourish with the encouragement of the Canadian Film Board. One is Christopher Chapman who started five years ago with a beautiful first attempt, *The Four Seasons;* and made, last year, a very exciting industrial film. This was on the Saguenay project, for Alcoa Aluminum. Tom Daily, of the Canadian Film Board, showed several one-hour television films. They were all very exciting; but I think the one titled,



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I Was a 90 Pound Weakling is the most biting satire on the health fetishes I have ever seen. Another Canadian, Hillary Harris, showed us his last film, a 35mm industrial in color, made in England; *Seaward the Great.* It was supervised by John Grierson. I think it is one of the best industrial films of the year. The film that impressed me most was an industrial entitled *Glass,* made by Bert Haandstra in Holland. The theme is glass blowing. It has no narration —just music and film rhythm. It is unbelievably beautiful and very amusing, with lovely montages of color, movement and music. I shall never forget the expressive faces and hands of those skilled glass blowers. I would put three shorts by the Swedish film maker Sucksdorf in the same class: *The City; Divided World;* and *Gypsies.* The only American films that had this type of beauty and emotional appeal for me were two by Dr. Roman Vishniac.

Clam movements

One was an abstract on waves, the other a science film on microorganisms at the seashore titled *The Living Tide.* Dr. Vishniac is a biologist who has a real love for his subjects. He has a most colorful personality and when he talks of the movement of a clam in the tide, you would think he was describing the hip movements of Marilyn Monroe in one of her most sexy moods.

I wish I had space enough to describe all the films shown at the seminar. There were teaching films on physics, made by the Physical Science Study Group, presented by Kevin Smith and Jack Churchill. The Puerto Rican Community Education Film Project showed three new films. A young American film maker, Don Pennabaker, showed a group of very exciting films made with a mobile synchronous sound technique developed by him and Richard Leacock. They are now working on a series of reportage type films for *Time* and *Life.* I saw a group of experimental abstract films. You may ask, "What has an abstract animated film to do with the Flaherty method?" The answer is that both types are exploring the film medium as a method of communication. They are experimenting creatively with new forms and new methods.

Not all experiments are successes. Some seem to be complete failures. But we must be open minded and grateful for sincere efforts, even if we are not ready to accept them. As a group, we are too ready to tear down the efforts of those trying something new.—THE END

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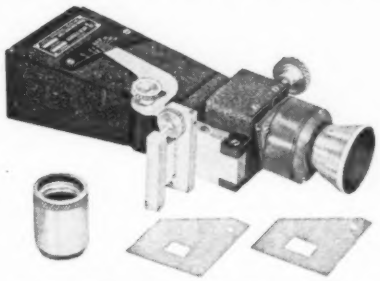

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(*continued from page 64*)

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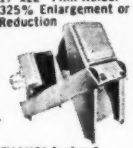

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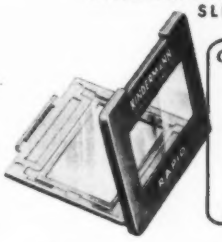

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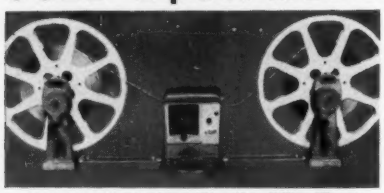

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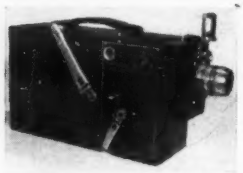

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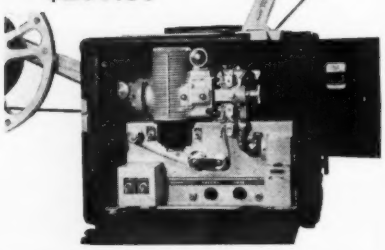

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Get more information. Circle 535, page 87

ADVERTISERS' INDEX

OCTOBER 1960

ALLEGRO FILM SERVICE	104
ANIMATED PRODUCTIONS, INC.	103
ANSCO DIVISION (General Aniline & Film Corp.)	THIRD COVER
ARRIFLEX CORP. OF AMERICA	21
BALD EAGLE CORP.	103
BEATTIE-COLEMAN, INC.	3
BENSON-LEHNER CORP.	89
BERGMAN ASSOCIATES, THE	93
BERKEYCOLOR	84
BESELER COMPANY, CHARLES	17
BOOSEY & HAWKS, INC.	104
BRONICA, DIV. OF CAPROD, LTD.	19
BROOKS CAMERAS	98
BURKE & JAMES, INC.	13
BURLEIGH BROOKS, INC.	15
BYRON, INCORPORATED	20
CALUMET MFG. CO.	24
CAMERA EQUIPMENT COMPANY	11-12
CAPITOL LIBRARY SERVICES	93
CAPROCK DEVELOPMENTS	104
CARR CORP.	85
CARR PLASTICS CORP.	104
CENTURY ENGINEERING CO.	104
CINEFFECTS, INC.	104
COLBURN LABORATORY, INC., GEO. W.	80
COLIND PHOTOGRAPHY	92
COLOR SERVICE CO.	104
COLUMBIAN ENAMELING & STAMP CO.	72
COMPCO CORPORATION	94
CORELLI-JACOBS FILM MUSIC, INC.	84
CRAIG CORPORATION	97
CRITERION FILM LAB INC.	94
CUSTOMCRAFT COLOR SERVICE	105
DAVIS & SANFORD, INC.	78
DIMCO-GRAY CORP.	101
DIRECTORY OF INDUSTRIAL DEALERS	76-77
DU PONT DE NEMOURS & CO., INC., E. I.	69
DURST (USA) INC.	8
DYMO CORPORATION	28
EASTMAN KODAK CO.	61, FOURTH COVER
EDWAL SCIENTIFIC PRODUCTS CORP.	60
EMDE PRODUCTS	102
FEDERAL MFG. & ENGR. CORP.	92
FILMCRAFT LABORATORIES, INC.	95
FISHER CO., OSCAR	SECOND COVER
FLIGHT RESEARCH	83
FLORMAN & BABB, INC.	6
FOREMANS INDUSTRIAL PHOTO DIVISION	99
GANZ CO., A. J.	80
GENERAL ELECTRIC CO., INC.	59
GENERAL RESEARCH LAB.	80
GEVAERT CO. OF AMERICA, INC.	71
GOLDBERG BROTHERS	101
GORDON ENTERPRISES	26
GRAFLEX, INC.	9
HALOID XEROX INC.	75
HASTINGS HOUSE PUBLISHERS	102
HEHN ENGINEERING, LESTER C.	81
HEITZ, KARL, INC.	29-30
HOLLYWOOD FILM ENTERPRISES, INC.	84
HOLLYWOOD VALLEY FILM LABS.	92
HOUSTON FEARLESS CORP.	23
HULCHER CO., CHARLES	78
HYTONE FILM LAB.	105
IDEAX CORP.	96
JACQUES, DON	102
JF FILM SERVICES	102
JOHNKE MANUFACTURING CO.	102
KALART CO. INC., THE	18
KENYON PRODUCTS, INC.	92
KEUFFEL & ESSER CO.	73
KIER PHOTO SERVICE	107
KIN-O-LUX, INC.	105
KLING PHOTO CORP.	10
KNIGHT TITLE SERVICE	103
KRANK-N-ROLL MFG. CO.	107
KURSHAN & LANG	94
LAB TV	82
LACEY-LUCI PRODUCTS COMPANY	106
LAFAYETTE INSTRUMENT CO.	60
LEEDAL, INC.	70, 82
LEITZ, INC., E.	5
LISCO PRODUCTS CO.	107
LOWEL-LIGHT PHOTO ENGINEERING	84
MACBETH INSTRUMENT CORP.	16
MACMILLAN CO., THE	106
MAGNASYNC CORP.	27
MEDICAL FILM GUILD, LTD.	108
METEOR PHOTOGRAPHIC CO.	79
MICHIGAN PHOTO SHUTTER CO.	103
MILLIKEN CO., D. B.	78
MITCHELL CAMERA CORP.	25
MULTIPLEX DISPLAY FIXTURE CO.	85
NATURAL LIGHTING CORP.	81
NEGA-FILE CO., THE	95
NUARC CO., INC.	82
NUCLEAR PRODUCTS COMPANY	82
PAILLARD, INC.	7, 90-91
PAKO CORPORATION	62
PALMER FILMS, INC., W. A.	98
PHOTO RESEARCH CORP.	81
PHOTOCHRON RESEARCH, INC.	103
PHOTOMART	93
PLYMOUTH PRODUCTS CO., INC.	14
POLACOAT, INC.	106
POLLACK EDITING, DAVID	105
PORTER MFG. & SUPPLY CO.	103
POST CO., FREDERICK	74
PRESTOSEAL MFG. CORP.	72
PRO-CHEM CO., INC.	105
QUARTZ RADIATION CORP.	68
RADIANT MFG. CORP.	81
RAPID COLORPRINT	97
RAPID FILM TECHNIQUE	105
READERS SERVICE CARD	87-88
REPRODUCTION ENGINEERING CORP.	101
SAMPLE ENGINEERING CO.	106
SAUNDERS COMPANY, THE	13
SCHEIBE ENGINEERING, INC.	105
SEKONIC, INC.	79
SIMCO CO., THE	104
SOCIETY OF MOTION PICTURE AND ENGINEERS	77
S.O.S CINEMA SUPPLY CORP.	105
SPINDLER & SAUPPE	86
STANDARD FILM PROCESSING CO.	107
STATES SMELTING & REFINING CORP.	22
STRONG ELECTRIC CORP., THE	74
SYLVANIA ELECTRIC PRODUCTS, INC.	63
TAMCO FILM LABS.	106
TOMORROW, INC.	95
UPSON CHEMICAL CORP.	64
VALENTINO, T. J.	96
VANGUARD INSTRUMENT	107
VOSS, INC., WALTER	107
WESTON INSTRUMENTS (DIV. OF DAYSTROM, INC.)	103
WOLLENSAK OPTICAL CO.	22

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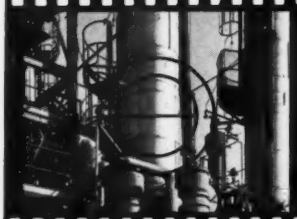
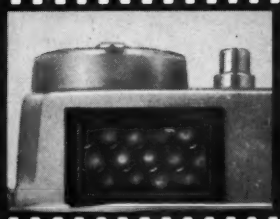
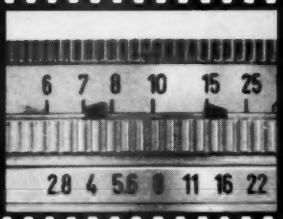


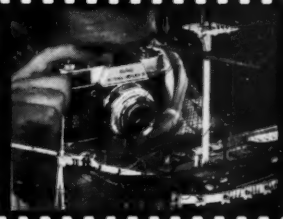
You have combination viewing and focusing—full-area ground-glass focusing plus split-image range-finder—both parallax-free.



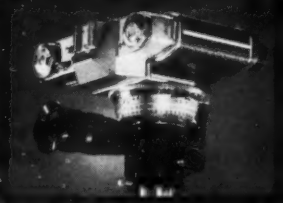
You have automatic meter-linkage to every lens—every shot can be a metered shot.



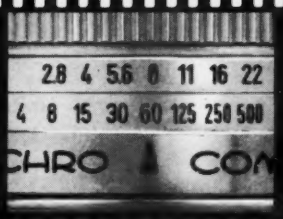
You have a precise, **automatic** depth-of-field scale on each lens: you know exactly what elements in any picture will be sharp.



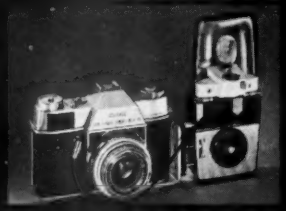
You have close-up lenses which let you approach within inches of your subject.



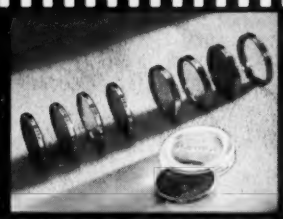
You can shoot through a microscope; make your own professional-quality photomicrographs.



You have a linked diaphragm and shutter. Exposure will stay right through all speed and aperture changes.



You have a camera with "X" and "M" flash settings which allow the use of any flash source.



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